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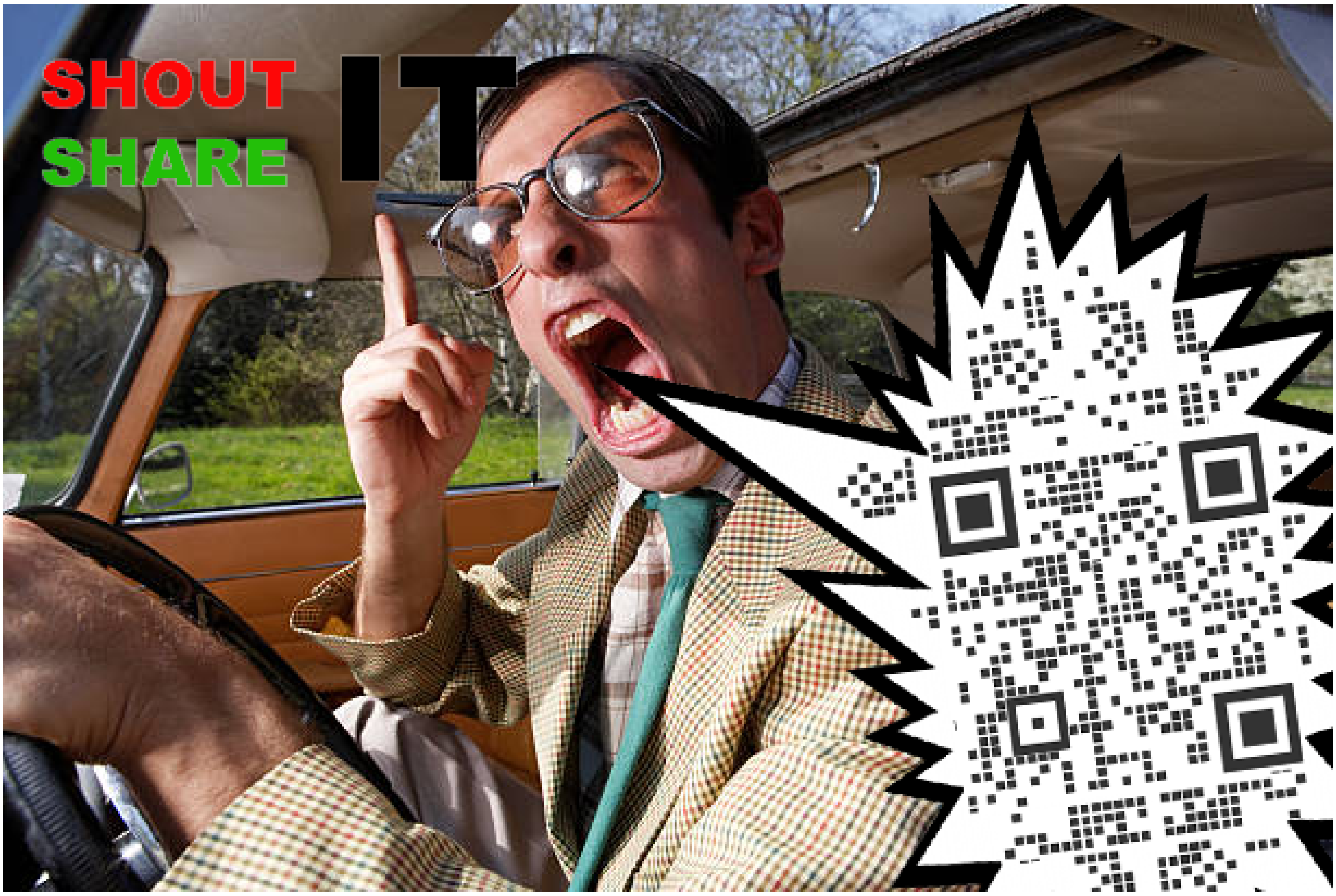
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BULLETIN

OF

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VOLUME XLIX, 1923-1924

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" III, August 29, 1924.
" IV, September 3, 1924.
" V, September 5, 1924.

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ERRATA

Page 33, column 1, line 3, for *somsalicu* read *somalicus.*
" 53, line 13 from bottom, for *Python sabæ* read *Python sebæ.*
" 146, bottom line, for *Atheris squamiger* read *Atheris squamigera.*
" 164, line 10 from bottom, for *Nectophryne wertheri* read *Nectophryne werthi.*
" 167, line 16 from top, for *Bufo steindachneri* read *Bufo steindachnerii.*
" 185, lines 9, 13, and 16 from bottom, for *Arthroleptis wahlbergi* read *Arthroleptis wahlbergii.*
" 186, line 15 from top, for *Hylambates greshoffi* read *Hylambates greshoffii.*
" 199, line 6 from top, for *Arthroleptis lameeri* read *Arthroleptis lameerei.*
" 199, line 3 from bottom, for *Arthroleptis reicheri* read *Arthroleptis reichei.*
" 221, lines 11 and 16 from top, for *Rana bibroni* read *Rana bibronii.*
" 322, line 14 from top, for *Hylambates greshoffiii* read *Hylambates greshoffii.*
" 344, line 19 from top for *Anhydrophrnye* read *Anhydrophryne.*
" 457, line 10 from bottom, for evne read even.

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THE AMERICAN MUSEUM OF NATURAL HISTORY

VOLUME XLIX, 1923

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Article I.—CONTRIBUTIONS TO THE HERPETOLOGY OF THE BELGIAN CONGO BASED ON THE COLLECTION OF THE AMERICAN MUSEUM CONGO EXPEDITION, 1909–1915[1]

PART II.—SNAKES

BY KARL PATTERSON SCHMIDT

WITH FIELD NOTES BY HERBERT LANG AND JAMES P. CHAPIN

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INTRODUCTION

The collection of snakes secured by the American Museum Congo Expedition nearly equals in interest the reptile material which formed the subject matter for Part I[1] of the present paper. The 914 specimens of snakes representing 43 genera and 81 species are distributed among the following families and subfamilies.

		Number of Specimens
Typhlopidæ	1 genus, 6 species	75
Leptotyphlopidæ	1 genus, 1 species	1
Boidæ		
Pythoninæ	2 genera, 3 species	44
Colubridæ		
Colubrinæ	19 genera, 32 species	347
Dasypeltinæ	1 genus, 3 species	20
Boiginæ	11 genera, 17 species	170
Elapinæ	4 genera, 7 species	71
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Viperinæ	4 genera, 12 species	186

As in the preparation of Part I of this report, my thanks are due to Dr. Thomas Barbour for the opportunity to study the valuable Cameroon collections of the Museum of Comparative Zoölogy. Through Mr. Henry W. Fowler the Academy of Natural Sciences of Philadelphia has loaned a small collection of West African snakes for comparative study. In connection with the work on distribution, the criticism and aid of Dr. J. Bequaert has been invaluable, and Messrs. Herbert Lang and James P. Chapin have added comment, criticism and advice to the advantage of the paper. The photographs were taken in the field by Mr. Lang, and form a valuable contribution to the illustration of the African snakes. It has been noted in the captions whether these photographs are from living or dead specimens.

The determination of the species of snakes occurring in the Belgian Congo is greatly facilitated by the 'List of Snakes of the Belgian and Portuguese Congo, Northern Rhodesia, and Angola,' by Dr. G. A. Boulenger (1915, Proc. Zoöl. Soc. London, pp. 193–223, Figs. 1–2), supplemented by the 'List of the Snakes of West Africa, from Mauretania to the French Congo' by the same author (1920, Proc. Zoöl. Soc. London, 1919, pp. 267–307, Figs. 1–2), which together serve as check lists of the snakes of the Rain Forest and the Sudan.

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[1] Schmidt, 1919, Bull. Amer. Mus. Nat. Hist., XXXIX, p. 385.

List of Localities from which Specimens are Recorded with their Approximate Latitude and Longitude

Aba.—3° 50′ N., 30° 10′ E.
Akenge.—2° 55′ N., 26° 50′ E.
Avakubi.—1° 20′ N., 27° 40′ E.
Babonde.—2° 17′ N., 27° 40′ E.
Bafuka.—4° 20′ N., 27° 50′ E.
Bafwabaka.—2° 10′ N., 27° 50′ E.
Banana.—6° S., 12° 20′ E.
Batama.—1° N., 26° 40′ E.
Boma.—5° 50′ S., 13° 10′ E.
Dungu.—3° 30′ N., 28° 30′ E.
Faradje.—3° 40′ N., 29° 40′ E.
Fort Beni.—0° 30′ N., 29° 30′ E.
Gamangui.—2° 10′ N., 27° 20′ E.
Garamba.—4° 10′ N., 29° 40′ E.
Irebu.—0° 35′ S., 17° 50′ E.
Leopoldville.—4° 25′ S., 15° 20′ E.
Malela.—6° S., 12° 40′ E.
Medje.—2° 25′ N., 27° 30′ E.
Nala.—2° 50′ N., 27° 50′ E.
Ngayu.—1° 40′ N., 27° 40′ E.
Niangara.—3° 40′ N., 27° 50′ E.
Niapu.—2° 15′ N., 26° 50′ E.
Pama.—2° 25′ N., 27° 50′ E.
Poko.—3° 10′ N., 26° 50′ E.
Rungu.—3° 0′ N., 28° 0′ E.
Stanleyville.—0° 30′ N., 25° 15′ E.
Yakuluku.—4° 20′ N., 28° 50′ E.
Zambi.—6° S., 12° 50′ E.

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List of New Species with their Type Localities

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Miodon unicolor	Poko	p. 119

Summary of the Distribution of African Reptiles

In the following pages I have attempted to gather the observations on the zoögeography of African reptiles, made during the systematic work embodied in this and the preceding paper, into a coherent form. If the resulting outline should prove useful as a basis for further work in this field, my end will have been accomplished. The account has accordingly been made as much descriptive and as little speculative as possible. The Malagasy fauna has not come within the scope of the present paper, and only a cursory examination of that intensely interesting subregion has been possible.

The real foundation of the zoögeography of African reptiles remains to be laid by future discoveries in the little-known tertiary palæontology of the continent, since experience has shown that even a small amount of palæontological evidence is of greater importance in the elucidation of a faunal history than the best-founded inferences from present faunæ. Even from the standpoint of the present, however, the last word must be said by the monographer of the families in question, dealing authoritatively with the relations of their genera.

In the maps of the ranges of genera the outlines have been sketched boldly, a considerable element of error being inherent in the imperfection of the data. The object of such maps is to exhibit graphically types of distribution rather than to establish the exact limits of ranges.

The method of zoögeographic study outlined by Tillyard (1914, Proc. Linn. Soc. New South Wales, XXXIX, p. 21) offers a most useful means of presenting distribution data. His method of mapping genera by means of lines ("specific contours") passing through localities with the same number of species is less practicable for vertebrates, for which lists of species from single localities are available only in the most intensively studied areas. The classification of types of distribution as Palæogenic, Entogenic, and Ectogenic is as useful in reptiles as in insects. Tillyard's definition of these terms (1917, 'The Biology of Dragonflies,' p. 281) may be quoted.

> 1. PALÆOGENIC GROUPS, or those archaic remnants whose distribution is discontinuous, extending over one or more regions. They are the last remains of groups which were once more widely spread.
>
> 2. ENTOGENIC GROUPS, or those groups which form the autochthonous or peculiar fauna of each region. They are not necessarily confined to a single region, since they frequently develop sufficient energy to spread over two or more regions. A group is, however, only ENTOGENIC in that region in which it forms a definite ZOOCENTRE (region of greatest density), placed definitely within the region.
>
> 3. ECTOGENIC GROUPS, or those groups which, being entogenic in a neighboring region, have invaded the region under discussion and have gained a footing in some part of it, thus modifying the composition of the fauna of that part. NO ZOOCENTRE is formed by any group in the region in which it is ECTOGENIC.

The term zoöcenter, proposed by Tillyard for the area of occurrence of the greatest number of forms of a group, is a concept quite independent of the "Center of Dispersal." It is here used as a purely descriptive term, without inference as to the origin of the group concerned, and it can be defined as the geographical center of distribution of the group. Tillyard has applied his method chiefly to the distribution of genera, studied by means of the sum of their species. In the present account, the families of reptiles are units, and are studied by means of the distribution of their genera. An ideal method of presenting the graphical results would be a composite photograph of the ranges of the genera of a family.

I am indebted also to Dr. A. Avinoff for valuable suggestions. In Dr. Avinoff's maps of distribution of Asiatic *Lepidoptera*, the classification of ranges as TYPICAL, confined to a given province, and EXTRA LIMITAL, showing the limits of influence of a given fauna, is most interesting, and in fact stands in close relation to the method of Tillyard.

I have attempted to combine the methods above outlined with the systematic survey of older zoögeographies, and the following account is accordingly divided into a systematic and a faunal part, the first a review of the distribution of the African genera of reptiles, the second an account of the faunæ of the zoögeographical subdivisions of the Ethiopian Region.

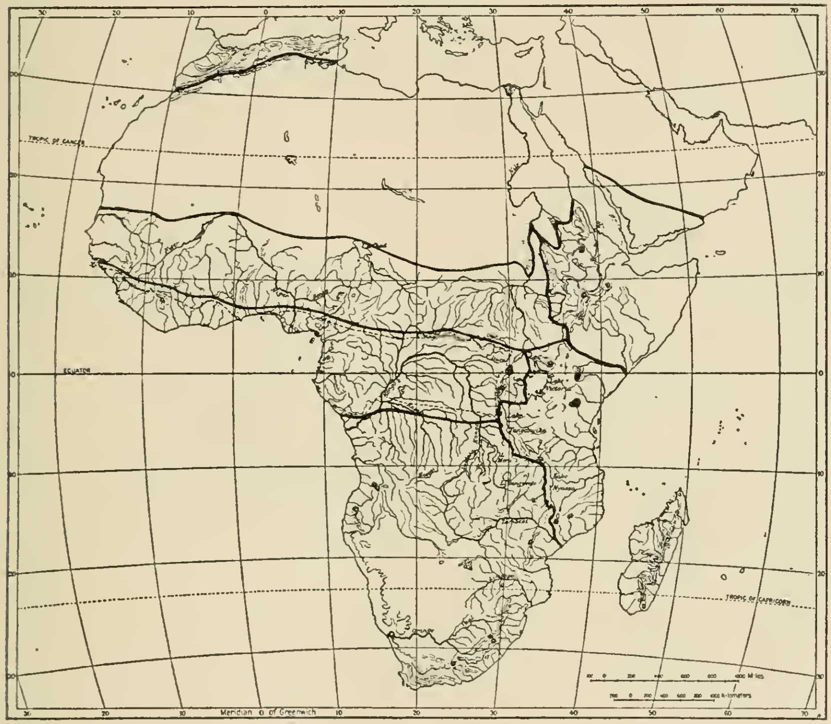
Distribution of Taxonomic Units

FAMILIES OF REPTILES IN AFRICA AND MADAGASCAR

FAMILY	NUMBER OF GENERA IN AFRICA	NUMBER OF GENERA IN MADAGASCAR	GENERAL CHARACTER OF DISTRIBUTION
Testudinata			
1. Testudinidæ	3	2	Palæogenic
2. Pelomedusidæ	2	2	Entogenic
3. Trionychidæ	3	0	Ectogenic
Loricata			
4. Crocodylidæ	2	1	Entogenic
Squamata			
5. Gekkonidæ	28	8	Palæogenic
6. Uroplatidæ	0	1	Entogenic
7. Agamidæ	5	0	Ectogenic
8. Iguanidæ	0	2	Palæogenic
9. Zonuridæ	4	0	Entogenic
10. Anguidæ	1	0	Ectogenic
11. Varanidæ	1	0	Ectogenic
12. Amphisbænidæ	11	0	Polyentogenic
13. Lacertidæ	17	0	
14. Gerrhosauridæ	3	2	Entogenic
15. Scincidæ	18	10	Palæogenic
16. Chamæleontidæ	2	2	Entogenic
17. Typhlopidæ	1	1	Palæogenic
18. Leptotyphlopidæ	1	0	Ectogenic
19. Boidæ			
a. Boinæ	1	4	Palæogenic
b. Pythoninæ	2	0	Ectogenic
20. Colubridæ			
a. Colubrinæ	39	14	Polyentogenic
b. Dasypeltinæ	1	0	Entogenic
c. Boiginæ	32	8	Polyentogenic
d. Elapinæ	9	0	Polyentogenic
21. Viperidæ			
a. Viperinæ	7	0	Entogenic

Testudinata

The distribution of African turtles has been briefly dealt with in Part I of the present paper (Schmidt, 1919, Bull. Amer. Mus. Nat. Hist., XXXIX, p. 401). Of the three families of turtles represented in the region, none is confined to it, and only one is entogenic. These families in turn are poorly developed, with only eleven genera in all.



Map 1. The zoölogical subdivisions of Africa (see p. 37).

The Testudinidæ have been considered palæogenic as a group because of the discontinuous distribution of *Testudo*, the relatively poor development of the family, and its presence in the Malagasy Islands. Aquatic genera of this family do not reach the Ethiopian Region, though *Clemmys* and *Emys* are found in Barbary.[1] Two distinct genera of land turtles (*Kinixys* and *Homopus*) have been developed on the continent, and two more (*Pyxis* and *Acinixys*) in Madagascar, all probably from an ancestral *Testudo* stock, though the relation is an ancient one. *Testudo* itself reaches a remarkable development, with two zoöcenters. The group of giant turtles in the Seychelles, Aldabra, Mauritius, Bourbon, and Madagascar is obviously on the decline with many recently extinct species in Madagascar and Mauritius. The "specific contours," although difficult to draw for this subregion, would show an area of least density of species at the center, or what Tillyard terms a "lacuna." It seems quite possible that this form of specific contour may be characteristic of declining groups. The South African group of species, on the other hand, with no less than twelve species south of the Zambezi, two in East Africa, and one in the Sudan and Abyssinia, presents a typical entogenic contour, and it is impossible to resist the conclusion that South Africa has become a secondary center of differentiation for a stock which arrived from the north, independently of the Malagasy group.

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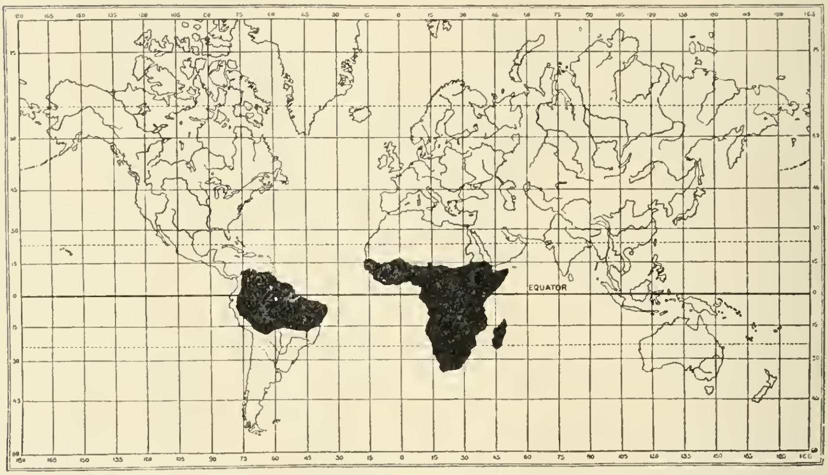
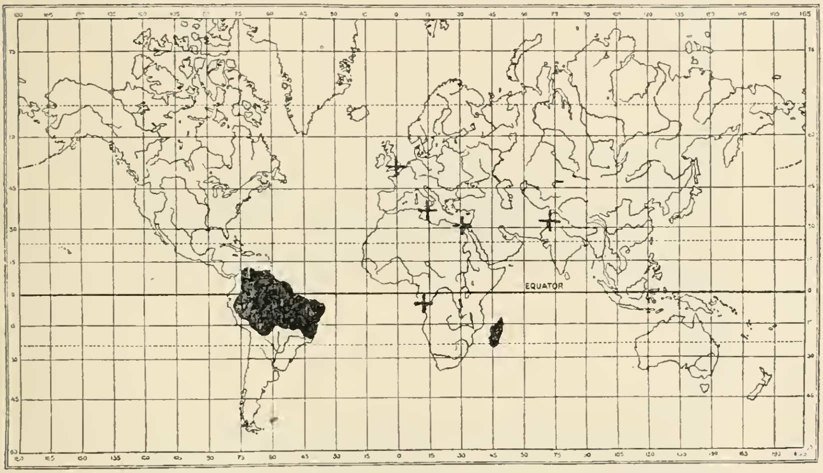
[1] The discovery of *Clemmys leprosa* in Dahomey (Chabanaud, 1917, Bull. Mus. Hist. Nat., Paris, XXIII, p. 105) is an important exception.



Map 2. The present distribution of the Pelomedusidæ (Turtles).

The Pelomedusidæ is an essentially African family, with four genera (including the fossil *Stereogenys*) known from the region. Of these, *Podocnemis*, with living species in Madagascar and northern South America, had a much wider distribution in the Eocene, when it reached northwest India, England, Egypt, and the Congo. Although the oldest known form (Palæocene) is from the lower Congo and fossil species are unknown from North America, the hypothesis of a northern pre-Eocene center of dispersal seems at least as well founded as the invocation of

Gondwana Land to account for the present distribution (Dollo, 1913, Ann. Mus. Congo Belge, (3) I, pp. 60–62, Figs. 1–3). Dollo (*loc. cit.*, p. 62) reaches the conclusion that the absence of *Podocnemis* from India and Africa at the present time is due to the competition of *Amyda*. The rather sparing representation of the Trionychidæ in Africa and the fact that they co-exist with *Pelusios* and *Pelomedusa*, quite as aquatic genera as *Podocnemis*, tell against this hypothesis. The range of *Pelusios* at present includes the entire Ethiopian Region, the Madagascan forms being so slightly differentiated as to suggest a recent or continued arrival. *Pelomedusa* is less widespread, being absent from the Rain Forest and from Madagascar.



Map 3. The present and past distribution of the genus *Podocnemis* of the Pelomedusidæ.

The TRIONYCHIDÆ is the most recent group of turtles to reach Africa, being absent from Madagascar and even from South Africa. The zoöcenter of *Amyda* is in eastern India and only a single species reaches Africa, where its range includes the Nile, Congo, and Niger river systems. To have reached so wide a distribution without differentiation argues a rapid and recent spread, although fossil species of this genus are known from the Miocene of Egypt (Dollo, *loc. cit.*). *Cycloderma* and *Cyclanorbis* form with the East Indian *Emyda* a well differentiated section of the family and, with much more restricted ranges in Africa, appear to have reached that continent at a much earlier date than *Amyda*.

Genera of Gekkonidæ in Africa and Madagascar

	Genus	Character of Distribution in Africa	Area in Which Entogenic	Area in Africa in Which Ectogenic	Remarks
1.	*Hemitheconyx*	Entogenic	West Sudan	....	Monotypic
2.	*Holodactylus*	Entogenic	Northeast Africa	....	Monotypic
3.	*Chondrodactylus*	Entogenic	South Africa	....	Monotypic
4.	*Ptenopus*	Entogenic	South Africa	....	Monotypic
5.	*Palmatogecko*	Entogenic	South Africa	....	Monotypic
6.	*Stenodactylus*	Ectogenic	Southwest Asia	North Africa	Map 4
7.	*Tropiocolotes*	Entogenic	Barbary	....	....
8.	*Narudasia*	Entogenic	South Africa	....	Monotypic
9.	*Bunopus*	Entogenic	Northeast Africa	....	....
10.	*Gymnodactylus*	Ectogenic	Polyentogenic	North Africa	World Wide
11.	*Saurodactylus*	Entogenic	Barbary	....	Monotypic
12.	*Pristurus*	Entogenic	Northeast Africa	....	Map 5
13.	*Paragonatodes*	Entogenic	East Africa	....	....
14.	*Ancylodactylus*	Entogenic	Cameroon	....	....
15.	*Phyllodactylus*	Ectogenic	Polyentogenic	....	World Wide
16.	*Diplodactylus*	Palæogenic	Australia	East and West Africa	Map 6
17.	*Ebenavia*	Palæogenic	Madagascar	....	Australian
18.	*Œdura*	Palæogenic	Australia	South Africa	....

Genera of Gekkonidæ in Africa and Madagascar (*Continued*)

	Genus	Character of Distribution in Africa	Area in Which Entogenic	Area in Africa in which Ectogenic	Remarks
19.	*Ptyodactylus*	Entogenic	North Africa	....	Reaches Sind
20.	*Hemidactylus*	Polyentogenic	Rain Forest Northeast Africa	 South Africa	 World Wide
21.	*Geckonia*	Entogenic	North Africa	....	....
22.	*Bunocnemis*	Entogenic	Sudan	....	....
23.	*Lygodactylus*	Polyentogenic	Madagascar	Central Africa	....
24.	*Microscalabotes*	Entogenic	Madagascar	....	....
25.	*Blæsodactylus*	Entogenic	Madagascar	....	....
26.	*Homopholis*	Entogenic	South Africa Madagascar		 ....
27.	*Geckolepis*	Entogenic	Madagascar	....	....
28.	*Æluronyx*	Entogenic	Madagascar	....	....
29.	*Tarentola*	Entogenic	North Africa	Sudan?	....
30.	*Platypholis*	Entogenic	Northeast Africa	....	....
31.	*Pachydactylus*	Entogenic	South Africa	East Africa	....
32.	*Colopus*	Entogenic	South Africa	....	Monotypic
33.	*Phelsuma*	Entogenic	Madagascar	East Africa	....
34.	*Rhoptropus*	Entogenic	South Africa	....	....
35.	*Peropus*	Ectogenic	East Indies	Madagascar	Accidental

Loricata

In the crocodiles, in which the fossil forms had a greater range of development and a wider distribution than the living, speculation from the distribution of the living forms alone is profitless. Dollo (1915, Rev. Zool. Africaine, IV, p. 210), in discussing the discovery of a Mesosuchian (*Congosaurus bequaerti*) in the Palæocene of Landana, has commented on the parallel between the persistence of European Mesozoic types into the Tertiary in Africa and the survival there of the living crocodiles, which became extinct in Europe in the Pliocene.

It is interesting to observe that the African genera parallel the American in many characters. The members of the genus *Crocodylus* are divided into long- and broad-snouted species in both regions. The American *Caiman* and *Alligator* resemble the African *Osteolæmus* and *Osteoblepharon* in the strongly buttressed cranium and are distinguished in the same way, by the presence or absence of a nasal septum.

Crocodylus niloticus is a strong-swimming species, and it is probable that repeated colonization of Madagascar from the mainland has prevented the formation of a very distinct type derived from it in the Malagasy subregion.

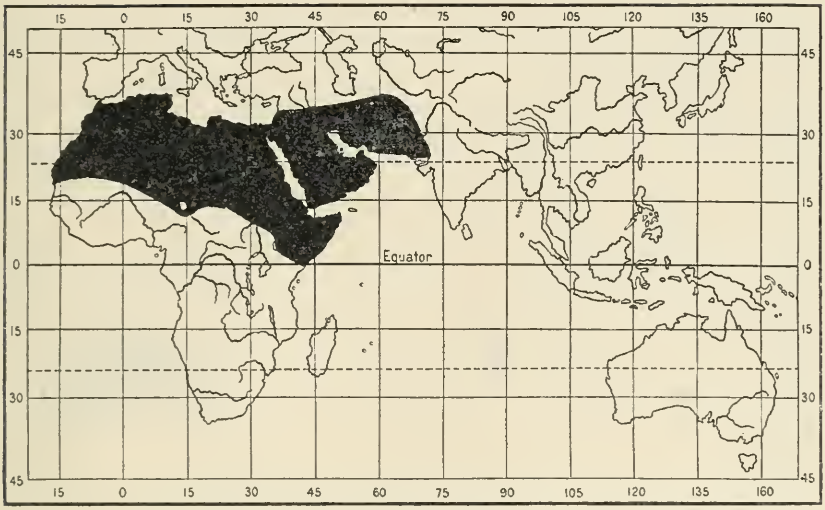
Squamata

Thirty-five genera of Gekkonidæ are found in Africa and Madagascar, of which seven belong essentially to the North African fauna. These are either ectogenic with a zoöcenter in southwest Asia (*Stenodactylus*, *Gymnodactylus*, *Ptyodactylus* and *Tarentola*) or entogenic in Barbary but closely related to a more widespread form (*Saurodactylus* to *Gymnodactylus*, *Tropiocolotes* to *Stenodactylus*, *Geckonia* to ? *Tarentola*).

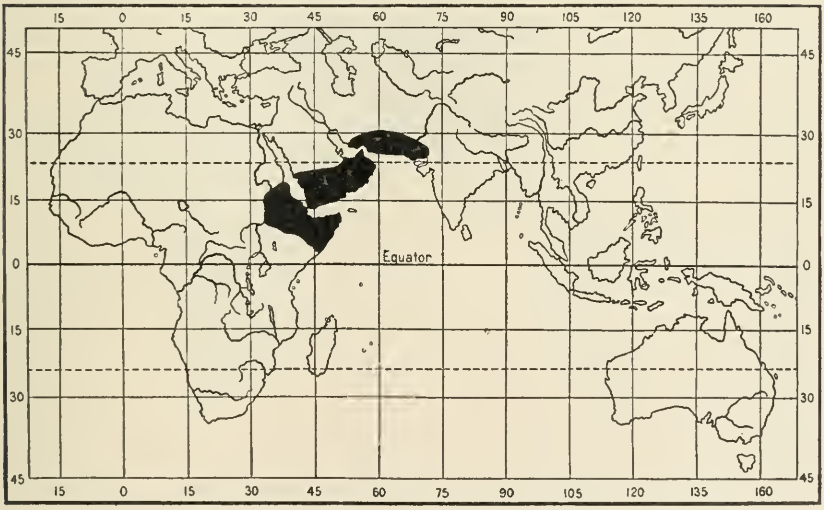
The twenty-eight remaining genera are nearly half the number in the family, which, but for the restricted or discontinuous distribution of many genera, might therefore be considered entogenic in Africa.

Four genera (*Microscalabotes*, *Blæsodactylus*, *Geckolepis*, and *Æluronyx*) are confined to Madagascar. Two reach the region only in Madagascar (*Ebenavia* and *Peropus*) and of these *Peropus* is probably accidental. Six genera are common to Madagascar and Africa (*Phyllodactylus*, *Diplodactylus*, *Hemidactylus*, *Lygodactylus*, *Homopholis* and *Phelsuma*).

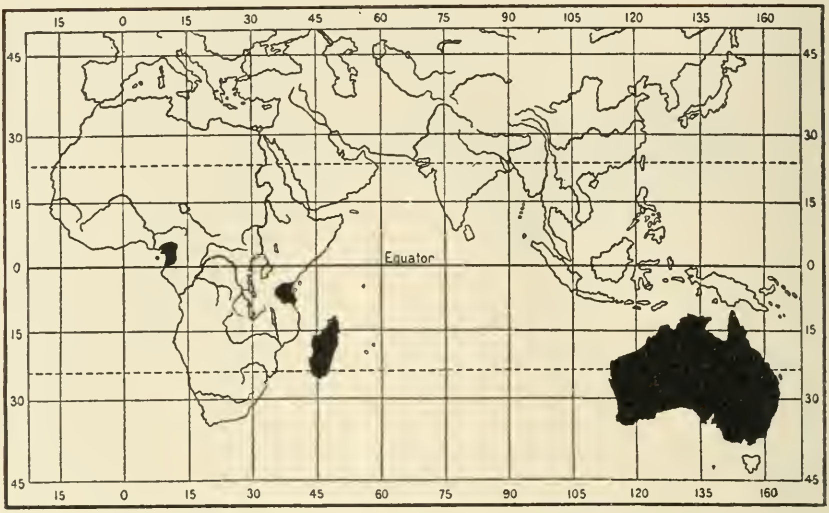
The remaining genera are highly interesting, constituting the entogenic gecko fauna of continental Africa. No less than four genera with undifferentiated digital lamellæ are confined to the deserts of South Africa. *Palmatogecko* with its completely webbed toes presents a highly interest-



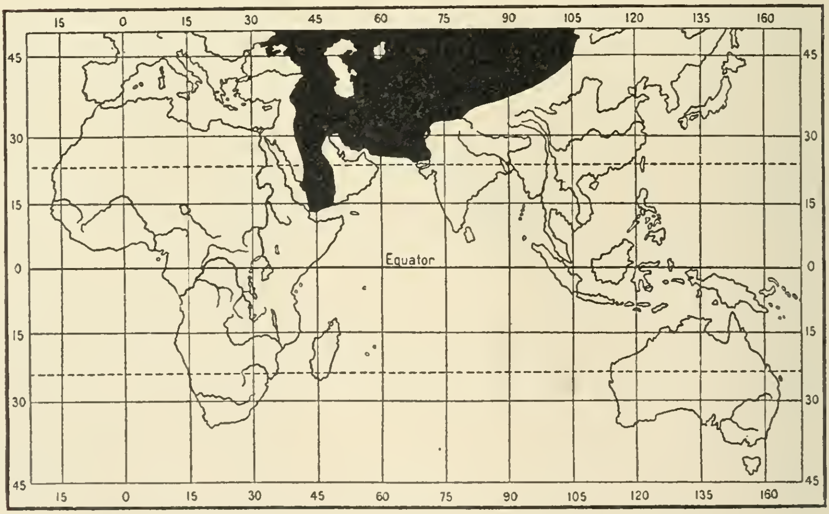
Map 4. Distribution of the genus *Stenodactylus* (Gekkonidæ).



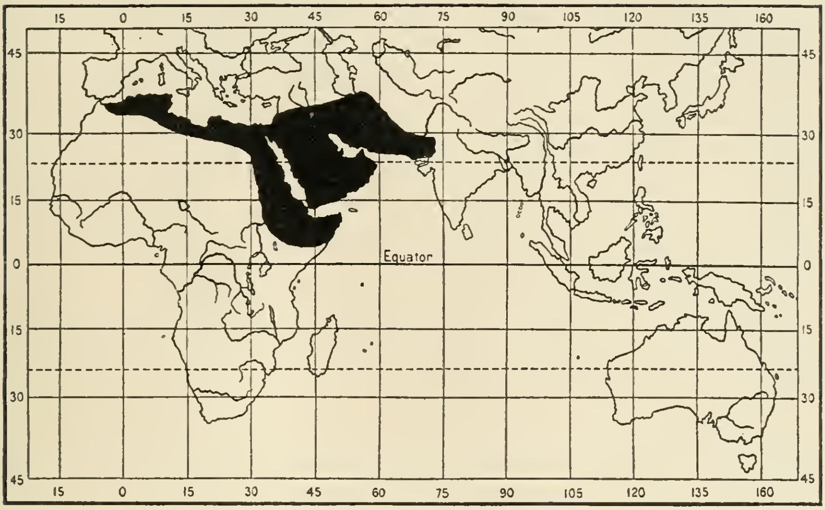
Map 5. Distribution of the genus *Pristurus* (Gekkonidæ).



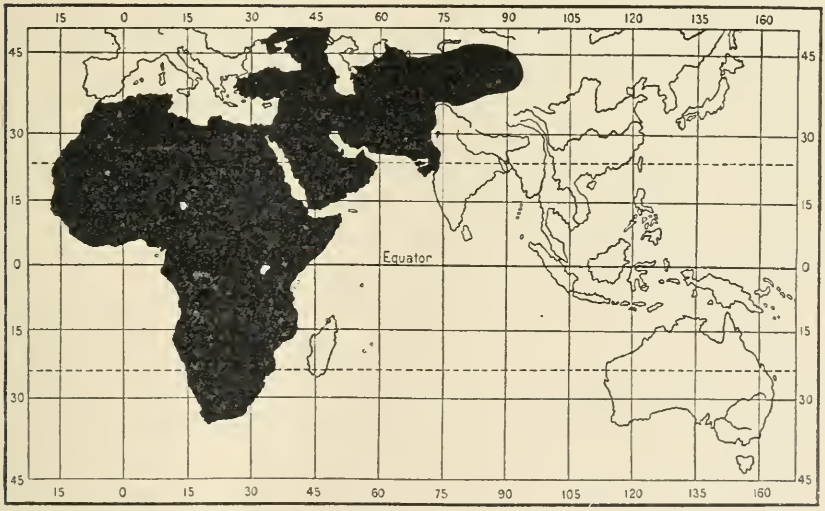
Map 6. Distribution of the genus *Diplodactylus* (Gekkonidæ).



Map 7. Distribution of the genus *Phrynocephalus* (Agamidæ).



Map 8. Distribution of the genera *Uromastix* and *Aporoscelis* (Agamidæ).



Map 9. Distribution of the genus *Agama* (Agamidæ). Maps 7, 8, and 9 illustrate hypothetical stages in the invasion of Africa by the Agamidæ.

ing and unique adaptation for locomotion in loose sand.[1] Among genera with digital lamellæ, *Colopus*, and *Rhoptropus* are confined to South Africa and *Pachydactylus*, with a large number of species, is entogenic in the same area. *Œdura* is a genus better developed in Australia, with two species in South Africa. *Ancylodactylus* is restricted to Cameroon. *Bunocnemis*, with two species, ranges through the Sudan and into East Africa. *Bunopus*, *Pristurus*, and *Platypholis* are northeast African, *Bunopus* reaching Arabia, *Pristurus* reaching Sind, and *Platypholis* reaching East Africa. *Paragonatodes*, in East Africa, is probably most nearly allied to the Oriental species of *Gonatodes*.

Of the more widely distributed genera, *Diplodactylus*, found in Cameroon, East Africa, and Madagascar, reaches a much greater development in Australia. The African species of *Phyllodactylus* have an irregular distribution and the absence of the genus in the East Indies is a notable peculiarity. *Hemidactylus*, though nearly world-wide in the tropics, is markedly entogenic in Africa, with two zoöcenters, one in the Rain Forest (nine species), and one in Northeast Africa (twenty species).

The two African genera *Hemitheconyx* and *Holodactylus*, usually referred to the family Eublepharidæ, are here associated with the primitive genera of geckos with undifferentiated digital lamellæ. Noble (1921, Amer. Mus. Nov., No. 4) has shown that some of the supposed characters of the family Eublepharidæ are in fact more widely distributed. While it is possible that the genera *Coleonyx*, *Eublepharis*, *Hemitheconyx*, and *Holodactylus* will be found to form a natural (monophyletic) group among the simpler geckos, in the present state of our knowledge of the group it seems best to avoid that assumption.

The family Uroplatidæ, with six species of a single genus, is confined to Madagascar and forms one of the chief distinctions of the Malagasy subregion.

The Agamidæ reach their greatest development in number of genera in the Oriental Region and their highest degree of differentiation in the Australian. The five genera found in Africa are terrestrial, though an occasional species lives in trees, in contrast with a great number of genera specifically adapted for arboreal life in the forests of the Oriental Region. The family and even three genera are ectogenic in Africa, the two genera confined to the Ethiopian Region being obviously derived from more widespread forms.

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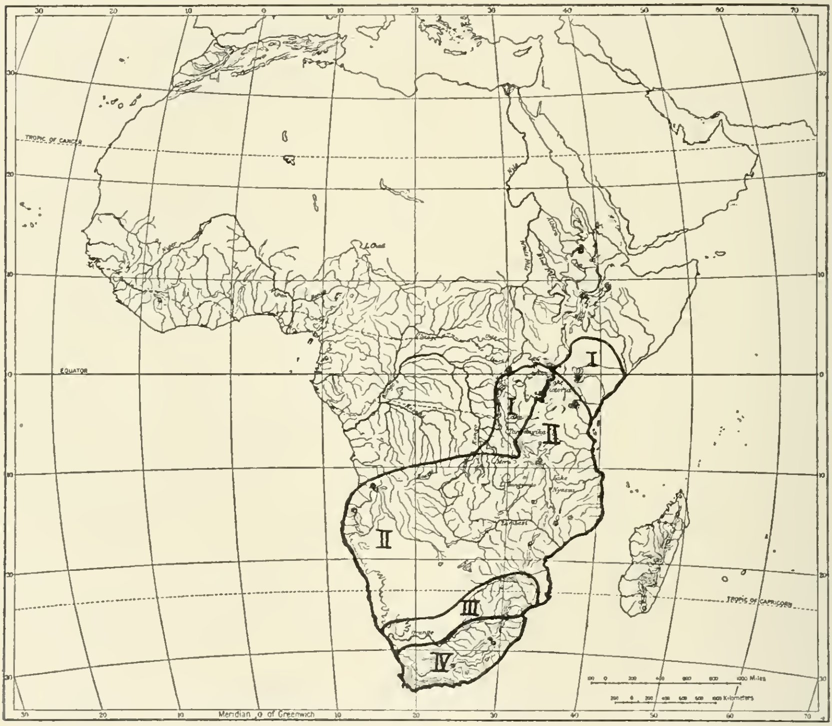
[1] I cannot follow Abel (1911, 'Palaeobiologie,' p. 358) in considering the webbed toes of *Palmatogecko* an adaptation for burrowing. Compare also Hitzheimer, 1913, 'Handb. Biol. Wirbeltiere,' p. 312.

Phrynocephalus is a genus highly developed in southwest Asia, adapted to desert life by fringed toes and the hidden tympanum. It reaches the Ethiopian Region only in Arabia, with a single species (Map 7). *Uromastix*, with a zoöcenter in Persia or Mesopotamia, ranges to Barbary, south to northeast Africa, and east to Sind. *Aporoscelis* (Map 8), with a species in northeast Africa and one in southern Arabia, is only slightly differentiated from *Uromastix* and is considered a subgenus by Anderson (1895, 'Contr. Herpetol. Arabia,' p. 34). *Agama*, the least specialized of the African forms and perhaps of the family, has a wide range in northwest India and southwest Asia but extends through the whole of Africa as well, reaching Barbary and Senegal as well as the Cape of Good Hope (Map 9). *Xenagama*, in northeast Africa, parallels *Uromastix* in its short and spinose tail but is otherwise closely related to *Agama*.

The three more widely spread genera may be regarded as illustrating probable successive stages in the invasion of Africa by terrestrial Agamidæ, with a hypothetical origin in central Asia. The time of arrival may be placed as coincident with the relatively recent dessication of North and East Africa, which opened a highway of dispersal for terrestrial and sand-loving species. The generalized *Agama* apparently found few competing forms in Africa and, unhampered by special adaptations for desert life, probably spread very rapidly once the savannahs were reached. The last stage in the spread of this genus is represented by the invasion of the Rain Forest, *Agama atricollis* entering from East Africa and *Agama colonorum* from the Sudan, the latter species everywhere keeping pace with the clearings and plantations of man. The fact that distinct species have not differentiated in the Rain Forest confirms the extreme recentness of its invasion by *Agama*. The close relations of the species grouped around *Agama hispida* in South Africa form an example of a recent development of a new zoöcenter.

The presence of the iguanid genera *Chalarodon* and *Hoplurus* in Madagascar parallels the distribution of *Podocnemis* (see above, p. 9) and that of the Madagascan Boinæ. The parallel with *Podocnemis* is completed by the presence of fossil remains referred to the Iguanidæ in the Eocene of Europe. It seems probable, therefore, that the Madagascan genera arrived from the north and that continental Africa at a former period was inhabited by members of this family. Gadow (1913, 'Wanderings of Animals,' p. 102) regards their extermination in Africa as due to the invasion of the Varanidæ. The Varanidæ, however, are themselves relatively late arrivals in the Ethiopian fauna.

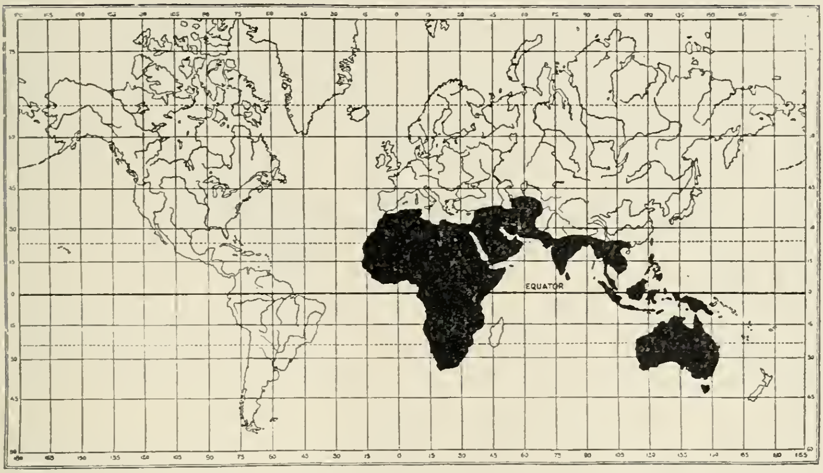
The *Paliguana* described from the South African Triassic by Broom (1903, Rec. Albany Mus., I, p. 1, Pl. I, figs. 1–2) is regarded by him as most closely related to the Iguanidæ (of the living families of lizards). Unfortunately, the gap in time between the Triassic and the Recent is so great that the importance of this species in the discussion of the present problem is much diminished. Boulenger (1918, C. R. Acad. Sci. Paris, CLXVI, p. 596, footnote) regards its relation to the Iguanidæ as very problematic.



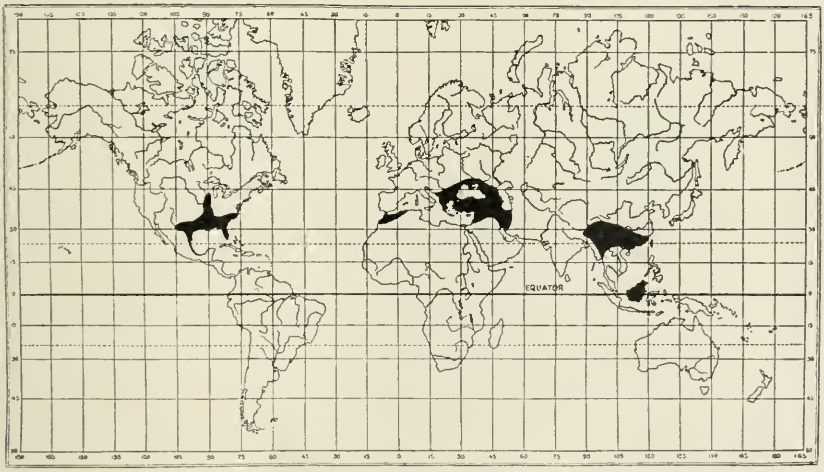
Map 10. Distribution of the Zonuridæ. Roman numerals refer to the number of genera present in the respective areas.

The status of the Oligocene *Proiguana europæa,* though based on fragmentary specimens, is a much better one. The early tertiary distribution of the Iguanidæ was doubtless closely similar to that of the genus *Podocnemis* (p. 9, Map 3).

The Zonuridæ form one of the most characteristic components of the Ethiopian fauna. The family is confined to the continent, and is entogenic in South Africa, the great majority of its species being confined



Map 11. Distribution of the Varanidæ.



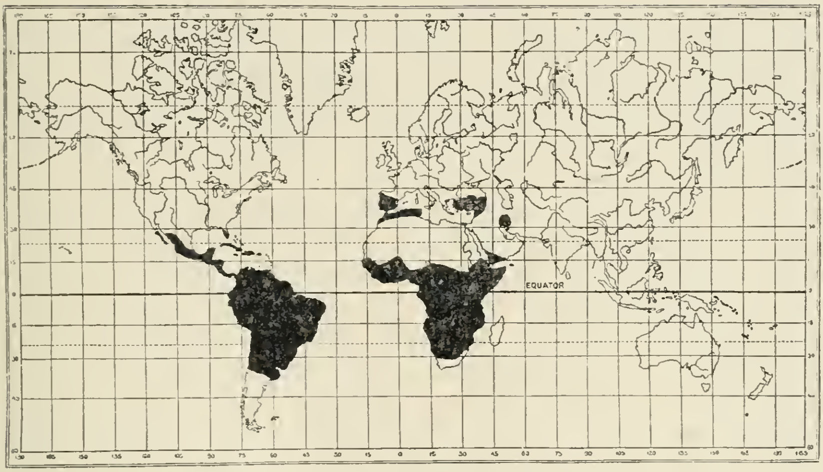
Map 12. Distribution of the genus *Ophisaurus* (Anguidæ).

to the area south of the Zambezi. The four genera present an extreme degree of differentiation, from the strong-limbed *Zonurus* to the practically limbless *Chamæsaura*. The apparent antiquity of the family makes it surprising that it is not represented in Madagascar. *Zonurus*, with fourteen fairly well developed species, is entogenic in South Africa, only three species ranging north of the Zambezi-Cunene line, *Z. cordylus* reaching Angola, while *Z. tropidosternum* is confined to East Africa and *Z. rivæ* to Somaliland. *Pseudocordylus*, with a single species, and *Platysaurus*, with three or four, are confined to South Africa. *Chamæsaura* has three species in South Africa, one ranging north into Angola (? and Rhodesia), and three in East Africa, two of which are confined to the Lake Region.

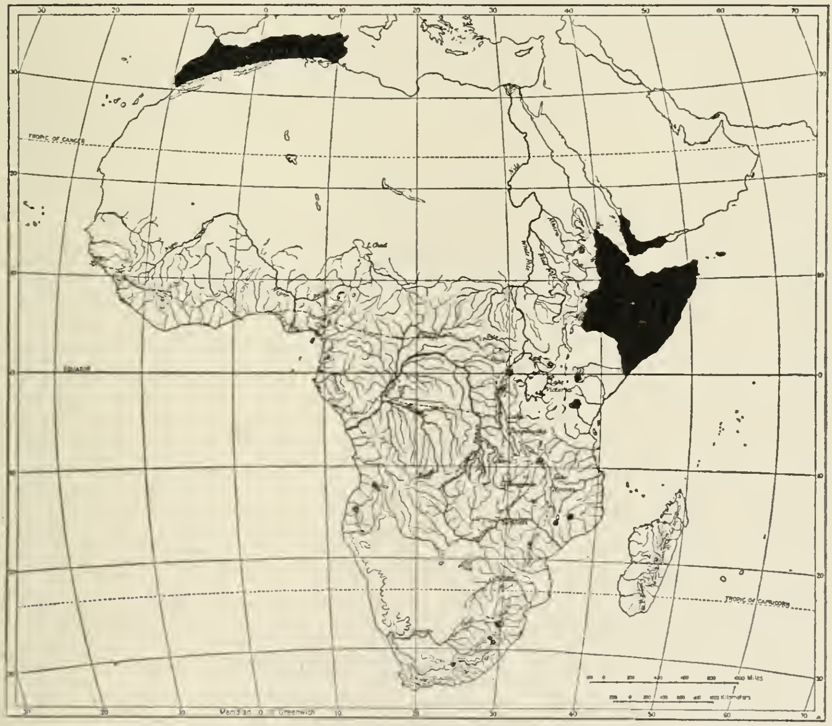
Zonurus tropidosternum Cope, described from Madagascar, has since been found only in Tanganyika Territory. The Madagascan record was doubtless erroneous, but it has been perpetuated in every subsequent mention of the distribution of the family.

The Anguidæ reach Africa only in Barbary, and *Ophisaurus koellikeri* is an European element in the Moroccan fauna. The species of the genus inhabit widely separated areas, *O. buttikoferi* in Borneo, *O. gracilis* and *O. harti* in southeast Asia, *O. apus* in southeast Europe and Asia Minor, and *O. ventralis* in the southern United States. It seems probable that the genus was formerly Holarctic and that the scattered surviving species came from a common northern center of dispersal. Map 12 exhibits a typical example of a palæogenic distribution.

The Varanidæ are a homogeneous group of lizards represented by a single genus with numerous species, all confined to the Old World. Fifteen species, besides several fossil forms, occur in the Australian Region, some of which have a very wide distribution, reaching the mainland in India. Six additional species are East Indian, and some of these in turn reach India. India has three species that are not found farther east, and one of these reaches central Asia and North Africa. In Africa there are two additional species, *Varanus niloticus* and *V. exanthematicus*, both very widely distributed. The poor development of the genus in Africa, together with its absence from Madagascar, suggests that the family has entered the Ethiopian Region recently. *Varanus griseus*, ranging from northwest India to Barbary and south to Abyssinia, is probably the last species to reach Africa. The older invasion probably consisted of two types, a long-headed ancestral *niloticus*, and a short-headed ancestral *exanthematicus*. The fact that *exanthematicus* has formed fairly well-defined subspecies in each of the three subdivisions of



Map 13. Distribution of the Amphisbænidæ.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Map 14. Distribution of the section Emphyodontes (Amphisbænidæ).

the Savannah Province, while *niloticus* with a wider range and a greater diversity of habitat has remained more uniform, is probably to be explained by the great activity and riparian habitat preference of the latter species, leading to rapid dispersal and reabsorption of varieties, while *exanthematicus* is notably sluggish and doubtless little inclined to travel.

The Amphisbænidæ have an unusual distribution, being essentially a tropical group at the present day, apparently an ancient one, from their presence in both Africa and America, but wholly absent from the Australian and Oriental Regions. This range, together with the fact that two genera reach the Palearctic and three the Nearctic, suggests a northern and possibly a Nearctic origin for the family. *Euchirotes*, *Bipes*, and *Hemichirotes*, in Lower California and Mexico, appear to form the most primitive subdivision of the group, although the writer prefers to consider them at most a subfamily (Bipedinæ). This type of distribution (Map 13) is also found in the Leptotyphlopidæ, and, with the distribution of fresh-water fishes, has frequently been the basis for the hypothesis of a Brazil-West African land bridge.

The amphisbænid fauna of Africa is a highly differentiated one, nine of the eleven genera being confined to the continent. *Blanus* is a Mediterranean genus reaching southern Europe. *Amphisbæna* is a generalized genus occurring both in Africa and tropical America. The Emphyodontes, one of the chief subdivisions of the family employed by Boulenger, form a rather natural group in distribution. *Trogonophis* is North African, *Agamodon*, Abyssinian, and *Pachycalamus*, Socotran, probably indicating a Mesopotamian origin of the ancestral *Emphyodontes*.[1] Of the remaining genera, *Baikia*, with a single species in Cameroon, is possibly closely related to the South American *Anopsibæna*. *Monopeltis* is the most characteristic African genus of the family, with twenty-two species, the remaining ten genera having only twenty-four species together. Fourteen of these are South African, seven are found in the Rain Forest, and one in East Africa. *Geocalamus* is derived from *Monopeltis* in East Africa. The three genera *Amphisbænula*, *Chirindia*, and *Placogaster* are more or less directly derived from *Amphisbæna* and have an irregular distribution. *Amphisbænula* occurs in Cameroon and East Africa, *Chirindia* in Rhodesia, Cameroon and East Africa, and *Placogaster* in the western Sudan. *Amphisbæna* itself has a wide range in Africa, from Portuguese Guinea to East Africa, and south to Southwest

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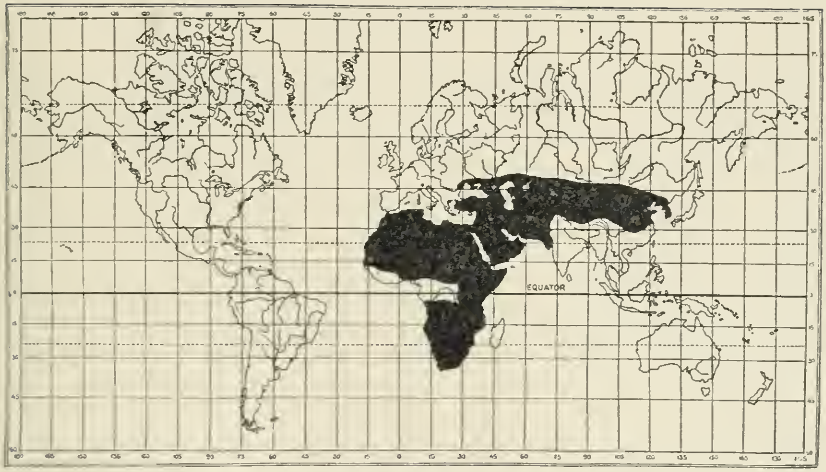
[1] The relations of *Diplometopon* Nikolski from southwest Persia may prove to be with the *Emphyodontes*.

Genera of Lacertidæ in Africa

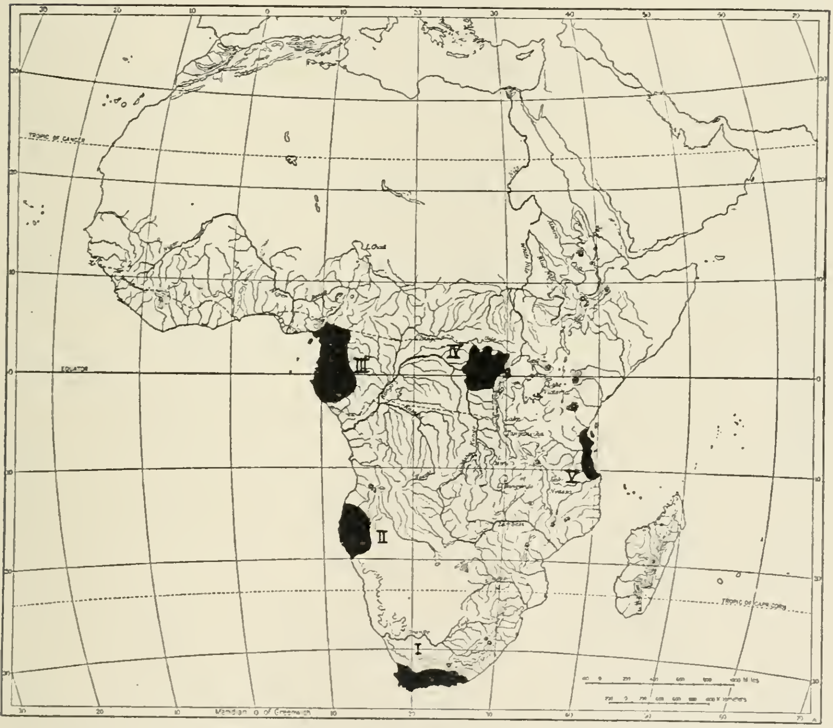
GENUS	CHARACTER OF DISTRIBUTION IN AFRICA	AREA IN WHICH ENTOGENIC	AREA IN AFRICA IN WHICH ECTOGENIC	REMARKS
Poromera	Entogenic	Cameroon	....	Monotypic
Gastropholis	Entogenic	East Africa	....	Monotypic
Bedriagaia	Entogenic	Ituri Forest	....	Monotypic
Lacerta	Ectogenic	Europe	North and Central Africa	....
Algiroides	Entogenic	East Africa	....	Mediterranean
Psammodromus	Ectogenic	Mediterranean	North Africa	....
Tropidosaura	Entogenic	South Africa	....	Monotypic
Nucras	Entogenic	South Africa	....	....
Latastia	Entogenic	East Africa	....	....
Philochortus	Entogenic	Northeast Africa	....	....
Acanthodactylus	Entogenic	North Africa	....	....
Ophiops	Ectogenic	Asia Minor	North Africa	....
Ichnotropis	Entogenic	South Africa	....	....
Eremias	Polyentogenic	....	....	....
Scapteira	Polyentogenic	Central Asia South Africa	....	....
Aporosaura	Entogenic	Southwest Africa	....	Monotypic
Holaspis	Entogenic	Central Africa	....	Monotypic

Africa and Mozambique, with no apparent relation to the extension of the Rain Forest. The entire absence of the family from southwestern Cape Colony is a rather striking feature of its distribution in view of the considerable number of forms which reach South Africa both in Southwest Africa and Natal.

No family of lizards presents more interesting or more complicated distributional relations in Africa than the Lacertidæ. Seventeen of the twenty-one genera reach the continent, though two of these, *Psammodromus* and *Ophiops*, reach only the Palearctic area in Barbary. Five of the genera have a very restricted distribution and four of these are monotypic. *Poromera* is confined to Cameroon and Gaboon; *Aporosaura* is found in southwest Angola and northwest Southwest Africa; *Gastropholis* is found in East Africa from Usumbara to the Rovuma; *Bedriagaia* is confined to the northeast part of the Rain Forest; and *Tropidosaura* is restricted to the southern part of Cape Colony, corresponding to the distinct Botanical Region of Engler. *Holaspis*, in many ways the most highly specialized member of the family, ranges through the whole of the Central African Rain Forest and reappears at Usumbara and near Lindi in East Africa. This distribution appears to antedate the present climatic and floral configuration. *Philochortus* and *Latastia* are characteristic of northeast Africa. *Philochortus* is confined to Abyssinia, Somaliland and southern Arabia, while *Latastia* ranges south to Mozambique and Rhodesia and west throughout the Sudan. *Nucras* and *Ichnotropis* are entogenic in South Africa, ranging north into East Africa. *Acanthodactylus* has a distribution almost exactly like that of the gecko *Stenodactylus* (Map 4); it is adapted to desert life and has kept pace with the desert conditions. *Eremias* (Map 15) has an extraordinarily wide range, from Korea to the Cape of Good Hope. It is a genus adapted to savannah or arid conditions and, in the absence of barriers other than deserts, has found its way wherever the conditions became suitable. No better illustration of the climate control of distribution could be found. Since it ranges continuously from the North Temperate to the South Temperate Zone, it is evident that rainfall and vegetation, and not temperature, have been the determining factors. The genus *Scapteira*, with a group of species in southwest Africa and another in central Asia, is doubtless diphylletic (Boulenger, 1918, Journ. Zool. Res., III, p. 3); fringed toes, a direct adaptation to desert life, have been acquired by two stocks of *Eremias*, one under the influence of the Kalahari, the other under that of the central Asian deserts. Possibly the absence of *Scapteira* (or its failure to develop) in the Sahara



Map 15. Distribution of the genus *Eremias* (Lacertidæ).


TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
I
II
III
IV
V
Meridian 0 of Greenwich

Map 16. Genera of Lacertidæ in Africa with restricted distribution: I, *Tropidosaura;* II, *Aporosaura;* III, *Poromera;* IV, *Bedriagaia;* V, *Gastropholis.*

and Mesopotamia is due to the presence of *Acanthodactylus* with the same adaptation. *Algiroides,* with a group of Mediterranean species, is represented in Africa by two very distinct species, *A. africanus* in the Ituri forest, co-existent with *Bedriagaia,* and *A. alleni* from Mount Kenia. *Lacerta,* which is the dominant lizard genus of the Palearctic, has a number of species in Barbary, and in the Madeira, Canary and Cape Verde Islands. Two species are found in central Africa, in the Lake Region, in the same area with *Algiroides africanus. Lacerta echinata* occupies the Rain Forest[1] and forms a distinct subdivision (*Centromastix*) of the genus, while the two species from the Lake Region are closely allied to the European groups *Zootoca* and *Podarcis.* Boulenger (1918, C. R. Acad. Sci. Paris, CLXVI, p. 594) reaches the conclusion that the Lacertidæ are of northern origin. The writer agrees with this conclusion in the main, but the evidence examined in detail is somewhat contradictory. Matthew (1915, Ann. New York Acad. Sci., XXIV, p. 180) has advanced the hypothesis that the most advanced types of a group are to be found at or near the center of dispersal of the group, while the more primitive are to be looked for at the periphery of the distribution. Examining the present family in the light of this rule, we find what Boulenger regards as the most primitive genus (*Nucras*), now confined to South and East Africa, represented by a fossil lizard in the Oligocene Baltic Amber. On the other hand, the most primitive living species of *Nucras* is the northernmost and the more advanced species are found in South Africa. This indicates a northern origin of the genus but a southern origin of existing species from a secondary center of dispersal in South Africa. The genus *Lacerta* offers more difficulty. The most primitive living species, *L. agilis* and *L. vivipara,* are the northernmost in distribution, inhabiting the north of Europe and Asia. The genus reaches its highest development in number of species in the Mediterranean area (*L. muralis*), and its greatest degree of differentiation in the African Rain Forest (Sections *Centromastix, Zootoca,* and *Podarcis*).

The lacertid genera fall into two distributional groups, of forest and savannah genera:

Forest Genera	Savannah Genera
Poromera	*Ichnotropis*
Bedriagaia	*Tropidosaura*
Gastropholis	*Nucras*
Algiroides	*Eremias*

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[1] Dr. Boulenger has informed the writer that the absence of the interparietal is a common feature in *L. echinata,* and it is therefore probable that *L. langi* is a synonym of *echinata.*

FOREST GENERA	SAVANNAH GENERA
Psammodromus	*Latastia*
Lacerta	*Philochortus*
Holaspis	*Scapteira*
	Aporosaura
	Acanthodactylus
	Ophiops

The forest genera exhibit a high degree of differentiation and appear to have been long established. The discontinuous distribution of *Lacerta* and *Algiroides* might be explained on the hypothesis that they were driven southward during the last glacial period, the central African species (with the exception of *Centromastix*) being subsequently cut off from their Mediterranean relatives by the invasion of the desert. *Algiroides alleni,* confined to timberline on Mount Kenia, suggests this more forcibly than *Lacerta vauereselli, L. jacksoni,* and *Algiroides africanus,* which have adapted themselves to the tropical climate.

The distribution of the savannah genera is a wholly logical one, the range of *Eremias* embracing that of all the others. These have almost certainly entered Africa from the north—*Nucras, Tropidosaura,* and *Ichnotropis* first; *Acanthodactylus* last; the remaining genera at intermediate periods.

In recapitulation, the Lacertidæ appear to be one of the more recent families of lizards, and their absence from Australia and Madagascar and poor development in the Oriental Region indicates a Palearctic origin. The African Rain Forest has played an important part in their development and dispersal, being the present headquarters of a group of genera which are totally absent from the African and Asian savannahs and deserts, while the latter have afforded the chief means of dispersal for the remaining genera. The genus *Lacerta*, finally, exhibits an adaptation to temperate climates which has enabled it to occupy the northern portion of the Palearctic, so far as it is habitable for reptiles, the most northern species being the most widespread.

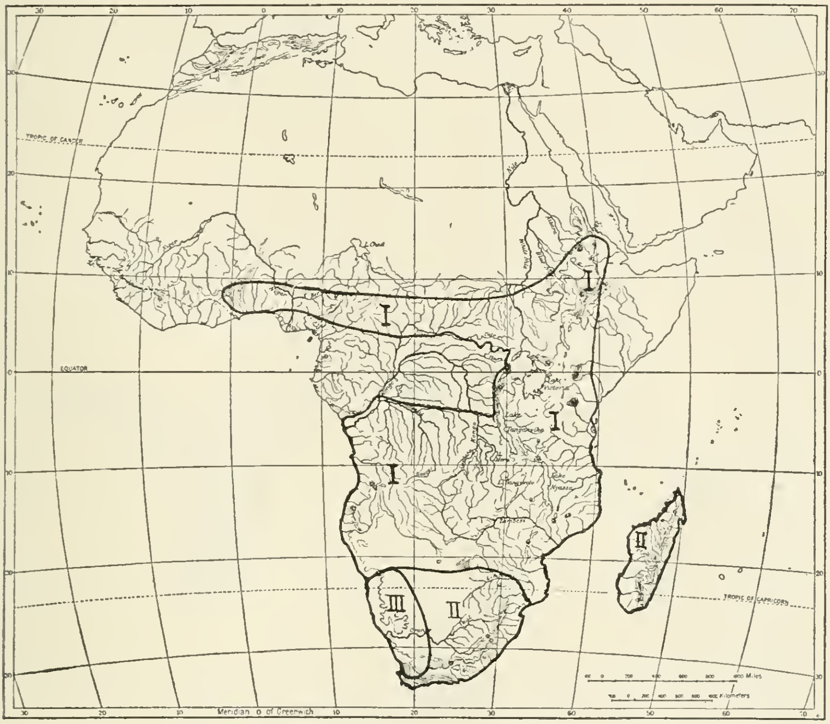
The GERRHOSAURIDÆ is one of the most highly characteristic groups of lizards in Africa and the only family except the Gekkonidæ and Scincidæ common to Africa and Madagascar, sufficient evidence of their ancient character.

The genus *Gerrhosaurus* is widespread with five distinct species and one or two additional, less differentiated forms. Of the five, four are essentially South African, *G. flavigularis*, however, reaching the Sudan. *G. major*, with a distinct subspecies in the western Sudan and possibly another in Eritrea, ranges farthest from the geographical center. *Cordy-*

Genera of Scincidæ in Africa and Madagascar

Genus	Character of Distribution in Africa	Area in Which Entogenic	Area in Africa in Which Ectogenic	Remarks
1. *Macroscincus*	Entogenic	Cape Verde Islands		Monotypic
2. *Mabuya*	Entogenic	South and East Africa		
3. *Lygosoma*	Ectogenic	Australia	North and Central Africa	Polyphylletic
4. *Ablepharus*	Ectogenic?	Australia?	South and East Africa	Accidental
5. *Plestiodon*	Ectogenic	Southwest Asia	North Africa	
6. *Scincopus*	Entogenic	North Africa		
7. *Scincus*	Ectogenic	Southwest Asia	North Africa	
8. *Chalcides*	Entogenic	North Africa		Reaches Sind
9. *Parachalcides*	Entogenic	Northeast Africa		Socotra
10. *Scelotes*	Palæogenic	South Africa Madagascar		
11. *Herpetosaura*	Entogenic	South Africa		
12. *Sepsina*	Palæogenic	South Africa Madagascar		
13. *Melanoseps*	Entogenic	Central Africa		
14. *Acontias*	Palæogenic	South Africa Ceylon		
15. *Typhlacontias*	Entogenic	South Africa		
16. *Acontophiops*	Entogenic	South Africa		
17. *Feylinia*	Entogenic	Central Africa		
18. *Typhlosaurus*	Entogenic	South Africa		
19. *Pygomeles*	Entogenic	Madagascar		
20. *Grandidierina*	Entogenic	Madagascar		
21. *Paracontias*	Entogenic	Madagascar		
22. *Pseudacontias*	Entogenic	Madagascar		
23. *Voeltzkowia*	Entogenic	Madagascar		
24. *Cryptoposcincus*	Entogenic	Madagascar		

losaurus and *Tetradactylus* are both confined to South Africa. The two Madagascan genera *Zonosaurus* and *Tracheloptychus* are very distinct, indicating that their presence in Madagascar probably dates from a very early period.



Map 17. Distribution of the Gerrhosauridæ. Roman numerals refer to number of genera in the respective areas.

The genera of Gerrhosauridæ, like the South African genera of Zonuridæ and Scincidæ, exhibit extremes of development of limbs, *Gerrhosaurus* being strong-limbed and active while *Tetradactylus* has small pentadactyl limbs in one species, tetradactyl in another, and undivided in a third.

The Scincidæ are nearly as widely distributed a family as the Gekkonidæ and undoubtedly are an ancient group. As in the Gekkonidæ, the greatest number of genera occur in Africa, but in the Scincidæ the highest degree of differentiation and the largest size is reached in the Australian Region.

The North African genera are widely distributed or strictly desert forms, mostly with a Mesopotamian zoöcenter. *Scincus* has almost exactly the same range as *Stenodactylus* and *Acanthodactylus* and, like them, it has fringed digits in adaptation to its sandy habitat. *Plestiodon* has a group of species with a similar range. *Chalcides* has the same range with the addition of southern Europe. *Mabuya*, largely represented in tropical Africa, has a single species in Algeria, and another in the Cape Verde Islands. *Macroscincus* is probably a genus derived from *Mabuya*. *Parachalcides* in Socotra and *Scincopus* in the Sahara appear to be derived from *Chalcides* and *Plestiodon* respectively.

Of the remaining African genera, *Lygosoma*, *Mabuya* and *Ablepharus* have nearly a world-wide distribution. *Lygosoma* is almost certainly a heterogeneous assemblage of species of varying degrees of relationship. It reaches an extraordinary development in the Australian and Oriental Regions, with nearly three hundred species in all, of which only twenty-seven are African. In Africa, it is largely confined to central Africa, and the majority of species are found in the Rain Forest. *Mabuya*, on the contrary, does not reach Australia and is poorly developed in the Oriental Region, while fifty-four species occur in Africa. The distribution of *Ablepharus* is plainly fortuitous. A single species is found throughout the tropics but the greatest number of species is in the Australian Region.

The remaining fifteen African and Malagasy genera exhibit varying degrees of reduction of limbs. Only one of them occurs outside the Ethiopian Region, *Acontias*, which has a number of species in Ceylon. Six are confined to Madagascar. Three, including *Acontias*, are common to Madagascar and South Africa, in addition to *Ablepharus* and *Mabuya*. Four of the remaining six genera are exclusively South African, while *Feylinia* and *Melanoseps* are found in the Rain Forest or in East Africa.

It is impossible to escape the conclusion that these burrowing Scincidæ have developed in South Africa and that their ancestors were present at a time of union of South Africa and Madagascar. The most degenerate forms have been placed in a separate family, with the Central American *Anelytropsis*, but it seems preferable to regard these as instances of convergence and to include the genera with the Scincidæ, from whose degenerate members they are separated only in degree.

The CHAMÆLEONTIDÆ[1] have a highly peculiar distribution. Their occurrence on most of the Malagasy islands, as well as on other African islands and in Ceylon, has been considered by Hewitt (1910, Ann. Transv. Mus., II, p. 68) as evidence of fortuitous distribution, and in this opinion the writer concurs. Werner (1902, Zool. Jahrb. (Syst.), XV, p. 312) has given a thorough account of the distribution of this group. Some of his maps fail to give sufficient account of the influence of the Rain Forest in determining the distribution of the species, but his general (negative) conclusion that it is impossible to correlate any well-marked group of species with a distinct type of distribution is well proved. The constancy of the genus in its main characters is nearly equalled by the extraordinary diversity of the species in minor, often sexual, characters.

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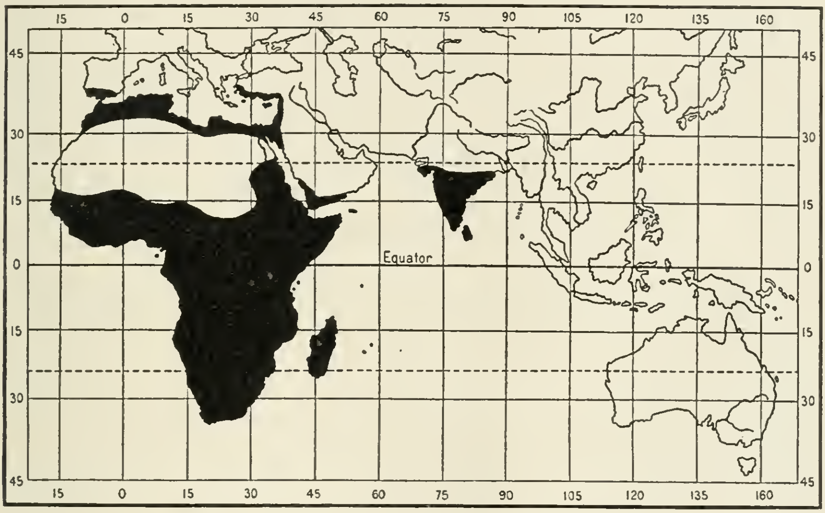
[1] The occurrence of *Chamæleon* in the Eocene of Wyoming (Leidy, 1873, Rept. U. S. Geol. Survey Terr., I, part I, p. 184, Pl. XXVII, figs. 38–39) is based on the presence of a small fragment of a jaw and requires additional material for confirmation.



Map 18. Distribution of the Chamæleontidæ.

The genus *Chamæleon* ranges throughout Africa and Madagascar, with forty-nine continental and thirty Madagascan species. One species is found in Ceylon and southern India, and the North African species reaches southern Spain and Syria. Nearly half of the species found in Africa occur in East Africa, and only two, *Chamæleon gracilis* and *C. dilepis*, are at all widely distributed. Most of the species are closely confined to the zoölogical provinces and subprovinces defined below.

The occurrence of *Paleochameleo* in the Oligocene of Quercy (De Stepheno, 1903, Atti. Soc. Italiana Sci. Nat. Milano, XLII, p. 391, Pl. IX, figs. 7, 12) indicates only a slight extension of the present range of the genus. It possibly points to a northern origin of the family. The relatively poor development of chameleons in South Africa contrasts with the distribution of the remaining groups which are common to Africa and Madagascar.

Chamæleon calcaratus of India and Ceylon belongs to the same group as the North African and Arabian species. The latter are now confined to the oases and the narrow coastal districts where sufficient vegetation exists to afford them resting places, and it appears that this North African group probably had an original (and recent) range which included southwest Asia and the Sahara. The encroachment of the desert has separated the forms of this group. The Indian chameleon has a wide range, and the fact that it is undifferentiated in Ceylon, suggests that it is a very recent arrival in the Oriental Region, coming from Mesopotamia via Sind.

The circumtropical distribution of the TYPHLOPIDÆ is clearly that of an ancient, paleogenic, group. The genus *Typhlops*, with the range of the family, is the only one represented in Africa and Madagascar. With few exceptions its species are confined to the zoögeographical subprovinces established below, though the distribution in many cases is very imperfectly known, often from only a single record.

Tabulation of the Distribution of African Species of *Typhlops*

SPECIES	FOREST	SUDAN	N. E. AFRICA	EAST AFRICA	SOUTH AFRICA
avakubæ	××××				
batesi	××××				
buchholtzii	××××				
cæcatus	××××				
congestus	××××				
decorosus	××××				
dubius	××××				
graueri	××××				
hallowellii	××××				
intermedius	××××				
leucostictus	××××				
preocularis	××××				
rufescens	××××				
steinhausi	××××				
vermis	××××				
zenkeri	××××				
cæcus	××××	××××			
crossii		××××			
punctatus		××××			
sudanensis		××××			
acutirostris			××××		
blanfordii			××××		
cuneirostris			××××		

Tabulation of the Distribution of African Species of *Typhlops* (*con.*)

Species	Forest	Sudan	N. E. Africa	East Africa	South Africa
somsalicu			××××		
unitæniatus			××××	××××	
guirræ				××××	
gracilis				××××	
lumbriciformis				××××	
platyrhynchus				××××	
tornieri	××××			××××	
schlegelii				××××	××××
mucroso				××××	××××
albanalis					××××
bibronii					××××
braminus					××××
capensis					××××
delalandii					××××
dinga					××××
fornasinii					××××
mossambicus					××××
obtusus					××××
schinzi					××××
tettensis					××××
verticalis					××××
viridiflavus					××××
anchietæ					××××
anomalus					××××
boulengeri					××××

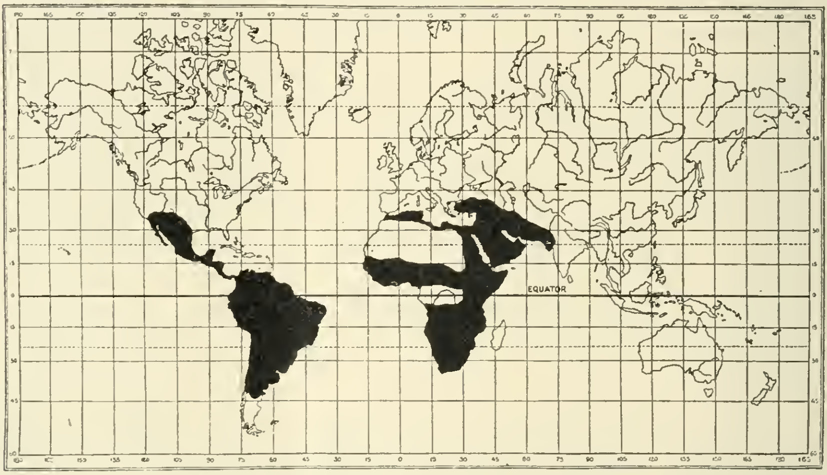
Seven species in addition to the above list are confined to islands in the Gulf of Guinea and along the east coast, and eight inhabit Madagascar.

The LEPTOTYPHLOPIDÆ have a distribution essentially like that of the Amphisbænidæ. In Africa the species are confined to the savannah or semi-arid areas, and to some extent this is also the case in the western hemisphere. The Amphisbænidæ are also somewhat better developed in the savannah districts (though nowhere confined to them) and the similarity of distribution is probably to be explained by the similarity of habitat relations and a similar period and origin of dispersal. The complete absence of the family from Madagascar indicates that this family, like most of the others absent from that island, entered Africa from the north and at a period subsequent to the separation of Madagascar from Africa.

The BOIDÆ have a highly peculiar distribution in Africa, the subfamily Pythoninæ being represented in the tropical parts of the continent, while the Boinæ are represented in North Africa and southwest Asia by

Eryx, and in the Malagasy Subregion by four (or five) genera more or less closely related to American forms.

Eryx has the typical distribution of a North African, sand-loving group, slightly extended into southwest Europe and peninsular India. *Eryx jaculus* ranges from Barbary to Persia and Turkestan; *Eryx thebaicus* is an Abyssinian form reaching lower Egypt and British East Africa; *Eryx jayakari* is confined to Arabia; and *Eryx muelleri* to the Sudan. The remaining Boinæ, in the Malagasy Islands, have been referred to American genera, with the exception of the well-defined *Boliera* and *Casarea*, known from Round Island, near Mauritius. The anatomical investigations of Beddard (1908, Proc. Zoöl. Soc. London, I, p. 135; and 1909, II, p. 918) appear to warrant generic distinction of the Madagascan species. *Xiphosoma* Duméril and Bibron appears to be available for the Madagascan species commonly referred to the American *Boa* (usually called *Corallus*) and *Acrantophis* Jan for the two Madagascan species referred to the American *Constrictor* (usually called *Boa*). *Pelophila* (type, *P. madagascariensis*) is preoccupied and unavailable, but without further examination of the distinctions between *Acrantophis dumerilii* and *A. madgascariensis*, the writer prefers to leave them in the same genus. This procedure, however, should not be allowed to disguise the fact that the Boinæ, with the exception of the genus *Eryx*, have a distribution almost exactly parallel to that of the Iguanidæ, one genus even occurring in Fiji, though it ranges more widely (to New Guinea) than the iguanid *Brachylophus*.



Map 19. Distribution of the Leptotyphlopidæ.

The genus *Python* has the range of *Varanus,* though it is absent in the desert areas of the range. Only three species are found in Africa, one very widely distributed, one Sudanese, and one Angolan.

The monotypic genus *Calabaria* is confined to the Rain Forest.

The single American genus of Pythoninæ, *Loxocemus,* is quite as exceptional in its range as the Madagascan Boinæ. If the division into subfamilies is not entirely artificial, the Boinæ have palæogenic distribution, while the Pythoninæ (with the exception of the Mexican genus) have a distribution like that of the Agamidæ or Varanidæ, most differentiated in Australia, ranging through the Oriental Region, and with a rather small and apparently recent intrusion into Africa.

The great assemblage of genera grouped as the family COLUBRIDÆ offers a stumbling block to the study of the distribution of snakes. Many of these genera are almost certainly heterogeneous, and even the subfamilies Colubrinæ and Boiginæ are more or less artificial groups. The two aquatic subfamilies Acrochordinæ and Homalopsinæ are not represented in Africa, and of the equally aquatic Hydrophiinæ only the extremely widespread *Pelamydrus platurus* occurs on the coasts of South Africa, and with *Enhydrus* on those of Madagascar. The opisthoglyph Elachistodontinæ, consisting of a single monotypic Indian genus, parallels the aglyph Dasypeltinæ which are purely African. The Elapinæ appear to be a more natural group, highly developed in Australia, where they form the greater part of the snake fauna, their differentiation being apparently due to a sudden expansion of the group into the varied habitat conditions of an unoccupied region. This subfamily is well represented in Africa with nine genera, of which only one ranges outside the continent. (The genus *Melanelaps* Wall, from southern Arabia, appears to be based on a specimen of *Atractaspis andersoni* Boulenger.) The Madagascan snake fauna is a highly peculiar one, seventeen of the twenty-one colubrine genera being confined to the Malagasy Subregion. It is furthermore a highly primitive one, the Elapinæ and Viperidæ being unrepresented, while of the twenty-one colubrine genera (thirteen *Aglypha,* eight *Opisthoglypha*), all but one agree in the primitive character of the possession of well-developed hypapophyses on the posterior vertebræ. The exception, *Mimophis,* is a genus related to the African and Indian *Psammophis.* Aglyphous genera with the posterior hypapophyses are widely distributed in Africa, as well as in Asia and America, and the derivation of the Madagascan genera from them offers no difficulties. Of opisthoglyphous genera, with the posterior hypapophyses, only four are found in Africa, one of which (*Pythonodipsas*) is South

African, another (*Ditypophis*) Socotran, and the third (*Rouleophis*) West African. *Geodipsas* is found in East Africa and Cameroon, as well as in Madagascar. Without overemphasizing the value of the character in question, it appears entirely probable that the Madagascan opisthoglyph snakes had a Madagascan origin distinct from that of the majority of the Boiginæ. Hewitt (1911, Rept. S. African Soc. Adv. Sci., VII, p. 313) advances the same opinion.

The relations of the African snake fauna with the American rest on the occurrence of species of the American genera, *Natrix*, *Helicops*, *Leptodeira*, and *Apostolepis*. Of these, *Natrix* and *Helicops* occur also in the Oriental Region, and are highly primitive genera, possibly not natural groups. *Leptodeira* appears to be an unnatural assemblage, even in Africa, where it includes strictly arboreal and strictly terrestrial forms. The separation of the African *Leptodeira* from the American cannot be based on the single anal plate (Barbour, 1914, Proc. New England Zoöl. Club, IV, p. 95) as specimens with a divided anal have been recorded among the arboreal African species. Boulenger, in describing *Apostolepis gerardi* from the Katanga (1913, Rev. Zool. Africaine, III, p. 104), states that it is unquestionably congeneric with the American species. This, however, is so isolated an example that it is impossible to give it weight as an evidence of South American faunal relations. More important is the fact that the three elapine genera *Elaps* (*Homorelaps* of Boulenger) in South Africa, *Micrurus* in South America, and *Furina* in Australia, are a more or less natural group within the subfamily, suggesting very strongly a divergent southward spread from a common Holarctic center, and not, in view of the absence from Madagascar of the Elapinæ, a dispersal via an Antarctic continent.

The relations of the African colubrine fauna with the Indian rest on the evidence of nine genera, of which *Natrix* and *Helicops* have already been mentioned. *Oligodon*, with an outlying species in Syria and Egypt, is an Indo-Malayan genus. *Coronella* is European and Mauritanian, with three species in central Africa; it does not appear to be a natural genus and certainly has not a natural distribution, unless the central African species correspond to the "Mediterranean element" of Lacertidæ. *Lytorhynchus*, *Zamenis*, *Psammophis*, and *Naja* are terrestrial, more or less sand-loving genera with a natural distribution, their origin being apparently central Asian. With the exception of *Lytorhynchus*, they range beyond the normal "Mesopotamian" type of lizard distribution, reaching South Africa (*Psammophis*, *Naja*) and peninsular India (*Zamenis*, *Psammophis*, and *Naja*). The boa *Eryx* and the viperine genera *Echis* and *Vipera* have a similar distribution. *Boiga*, with a number of species in the East Indies, eight in India, and three in Africa has a less natural distribution and is possibly an unnatural group.

Of the eighty genera of the Colubridæ found in Africa, four are purely North African or reach the continent only in North Africa. Of the eighty, only seventeen are found outside the continent, of which one (*Boædon*) is confined to the Seychelles and Africa, the other (*Geodipsas*) to Madagascar and Africa. The genera are to a considerable degree restricted to the provinces and subprovinces in Africa, as will be shown below under the discussion of these faunal subdivisions.

The seven genera of VIPERIDÆ in Africa belong to the subfamily Viperinæ. The only other genera in the subfamily are *Azemiops* in Burma and *Pseudocerastes* in Persia. Boulenger (1918, C. R. Acad. Sci. Paris, CLXVI, p. 597) has commented on the similarity in distribution between the Lacertidæ and the Viperinæ. The distribution, in fact, accords excellently with the hypothesis of a Palearctic and relatively recent origin, the two primitive genera *Azemiops* and *Causus* inhabiting southeast Asia and South Africa respectively as the result of divergent migration. The scarcely less primitive *Atractaspis* ranges through the whole of continental Africa and southern Arabia and reaches Persia. *Echis* and *Cerastes* are desert genera confined to North Africa and southwest Asia. *Vipera* compares in range with *Lacerta*, with one species, however, in India and Siam. *Atheris* is a forest genus ranging into East Africa, the Sudan, and northern Angola. It parallels the prehensile-tailed *Lachesis* of Central America to an astonishing degree. *Bitis* has the same range as *Atractaspis*, with a greater concentration of species in South Africa, whence it has apparently spread northward, developing two highly distinct species in the Rain Forest.

Faunal Areas

The close correspondence of the faunal areas with the botanical subdivisions of Africa recognized by Engler and illustrated in the botanical map of Africa (Schmidt, 1919, Bull. Amer. Mus. Nat. Hist., XXXIX, p. 399, Map 2) has been dealt with in Part I of the present paper. The maps of the distribution of individual species illustrate for the most part the correspondence of specific ranges with the larger or smaller subdivisions of the continent. The most practical modifications of the botanical map to conform to the distribution of African reptiles are illustrated in Map 1 and the resulting divisions may be tabulated as follows:

- *A.*—PALEARCTIC REGION
  - I.—Mediterranean Subregion
    - *a.*—Mauretanian Province
  - II.—Saharan Subregion
- *B.*—ETHIOPIAN REGION
  - I.—Ethiopian Subregion
    - *a.*—West African Forest Province
      - 1.—Gaboon Subprovince
      - 2.—Iturian Subprovince
    - *b.*—Savannah Province
      - 1.—South African Subprovince
      - 2.—East African Subprovince
      - 3.—Sudanese Subprovince
      - 4.—Abyssinian Subprovince
  - II.—Malagasy Subregion
    - *a.*—Seychellian Province
    - *b.*—Madagascan Province
    - *c.*—Mascarene Province

The chief reptilian characteristics of the faunal subdivisions may be briefly reviewed.

The Mediterranean Subregion is sharply distinguished from the remainder of the continent by the presence of Anguidæ and of many species and genera found in Europe but not in the remainder of Africa. *Emys orbicularis*, *Clemmys leprosa*, *Psammodromus*, and *Natrix natrix*, may be mentioned as examples of the European element in this fauna. There is, however, a strong admixture of the desert fauna next to be considered, making it quite impossible to draw a rigid boundary between this area and the next by means of the reptile fauna.

The Saharan Subregion corresponds to an extremely well-marked fauna composed, however, almost exclusively of forms definitely adapted to desert life and not characterized by any families of reptiles. This fauna has an enormous extension from east to west, from the Rio de Oro to Sind. Many species and genera have a range corresponding very exactly with this subregion; for example, *Stenodactylus*, *Acanthodactylus*, *Lytorhynchus*, and *Echis*. The complete absence of forms which have a zoöcenter south of the Sahara, together with the fact that the zoöcenters of nearly all the Saharan genera are outside the continent, in southwestern Asia, leads me to exclude this subregion from the Ethiopian Region, and add it to the Palearctic. The special conditions of the desert habitat have excluded both central African and Mediterranean species, and the desert accordingly acts as a barrier from south to north (or vice versa) quite as much as it has served as a highway of dispersal from east to west. Where the Nile cuts across it, a number of central African species have reached the Mediterranean coast (*Dasypeltis scaber*, *Mabuya quinquetæniata*, *Varanus niloticus* and various amphibians). A magnificent monograph of a part of this fauna exists in Volume I of Anderson's 'Zoölogy of Egypt.' The Egyptian fauna differs slightly from the strictly Saharan in the presence of the genuinely African element above mentioned, and also in having a slight admixture of Mauretanian or European forms. Quite evidently, the Mauretanian fauna has recently been encroached upon by the spread of the desert. The fauna of the Cape Verde Islands is largely a Mauretanian one and also suggests a former southward extension of the Mediterranean fauna.

The remaining subdivisions of the continent, together with the continental island of Madagascar and a number of adjacent islands, compose what is correctly termed the Ethiopian Region.

The Ethiopian Region is sharply divided into the Ethiopian and Malagasy Subregions. The latter, in whose fauna the absence of many of the African families of reptiles is nearly as striking a character as the presence of Uroplatidæ, Iguanidæ, Boinæ, and *Podocnemis*, is still to be subordinated to the Ethiopian Region for the sake of its fundamental relations. In addition to the widespread Gekkonidæ and Scincidæ, the essentially African Chamæleontidæ and Gerrhosauridæ are common to the two subregions. Still, the unmistakably primitive character of the Malagasy fauna, together with the absence of all the groups which appear to have reached Africa from the north or northeast, indicates a very ancient separation.

The Ethiopian Subregion falls into two rather closely related subdivisions, the West African Forest and Savannah Provinces, sharply separated by the distinct habitat conditions afforded on one hand by the moist and tropical Rain Forest, and on the other hand by the semiarid or arid open plains. There is, to be sure, a considerable interdigitation of these two provinces, especially in the outward extension of the Rain Forest along rivers, or in the forest "islands" which are entirely separated from the continuous Rain Forest itself. So far as the families of reptiles are concerned, the West African Forest Province is only negatively characterized by the absence of the Zonuridæ and Gerrhosauridæ, and a number of genera (and even species) are common to both the primary subdivisions of the subregion. The more important of these (excluding genera occurring outside the continent) are:

TURTLES

Kinixys *Pelusios*

LIZARDS

Monopeltis

SNAKES

Boædon
Lycophidion
Mehelya
Chlorophis
Philothamnus
Dasypeltis
Aparallactus
Dendraspis
Causus
Atractaspis
Bitis

The West African Forest Province is characterized by a considerable number of genera confined or nearly confined to it:

CROCODILES

Osteolæmus
Osteoblepharon

LIZARDS

Ancylodactylus
Diplodactylus
Baikia
Amphisbænula
Poromera
Bedriagaia
Algiroides
Holaspis
Feylinia

SNAKES

Calabaria
Hydræthiops
Gonionotophis
Bothrophthalmus
Bothrolycus
Holuropholis
Hormonotus
Gastropyxis
Hapsidophrys
Thrasops
Rhamnophis
Pœcilopholis
Grayia
Geodipsas
Boiga
Dipsadoboa
Elapocalamus
Polemon
Elapops
Boulengerina

Two characteristics of the fauna of the Rain Forest arrest attention. The first is the localization of the genera and species in the Gaboon and Ituri regions, of which some of the more important examples follow:

GABOON

Osteolæmus
Ancylodactylus
Baikia
Poromera
Gonionotophis
Pœcilopholis
Elapocalamus
Polemon
Chamæleon cristatus

ITURI

Osteoblepharon
Gonatodes
Bedriagaia
Lacerta (*Zootoca* and *Podarcis*)
Chamælycus
Chamæleon adolfi-friderici
Chamæleon johnstoni

The apparent absence of cœcilians in the Ituri may be due to the chance nature of collecting, and this difference in the two faunas should not be emphasized without the corroboration of much future collecting. Future collections from the Ituri will doubtless add further Gaboon types to its fauna.

In this case the topography, or rather the history of the topography, offers an explanation. The two centers of development correspond to distinct watersheds, the Gaboon-Cameroon area being cut off from the Congo Basin, while the Iturian area represents the headwaters of the Congo. These two areas are separated at the present time by great swamps and periodically flooded areas in the Central Congo, and it seems certain that, previous to the cutting of the gorge of the Lower Congo, this flooded and swampy area must have had a much greater extension, possibly as a vast inland lake. If, as Schwartz speculates (1918, S. African Journ. Sci., p. 104, Fig. 1), the Congo flowed northward to the Mediterranean, its present course being due to "stream capture," this central basin would have still been subject to inundation, which would be equally effective in isolating the Gaboon from the Ituri fauna. This separation by swamps or lakes, therefore, is held to account for the distinction of the two faunas.

The contradictory view that the fauna of the Rain Forest is essentially homogeneous throughout its extent has been emphasized by Boulenger (1919, Rev. Zool. Africaine, VII, p. 2). It is certainly a striking characteristic of the African fauna that so many species should have the enormous range from Liberia to the East African lakes without apparent differentiation. Thus the Gaboon and Ituri faunas are linked together by *Kinixys erosa*, *Crocodylus cataphractus*, *Hemidactylus fasciatus*, *Holaspis guentheri*, *Lygosoma fernandi*, *Feylinia currori*, *Chamæleon oweni*, and *Bitis gabonica* and *B. nasicornis* among a great number of snakes. This fact is explainable as due to the rapid spread of the species concerned through the uniform Rain Forest habitat produced by the partial draining of the Congo Basin. A means of dispersal, somewhat more indirect, existed continuously, however, about the borders of the supposed swamps or lakes, for the Rain Forest must have had a greater extent at that time due to the increased humid area on which the existence of a "Rain Forest" depends.

The hypothesis that this greater Rain Forest extended to the coast of East Africa is favored by the considerable element of forest forms remaining in the forest islands of East Africa. The genera, *Cycloderma*, *Diplodactylus*, *Holaspis*, *Melanoseps*, *Thrasops*, *Geodipsas*, *Chamætortus*, and *Atheris* exhibit this relation, with an additional list of typically forest species, such as *Lygodactylus fischeri* and *Bitis gabonica*, which extend to Usumbara. Sternfeld (1915, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 198) has advanced this explanation of the composition of the East African fauna.

The fact that the Savannah Province is much richer in genera, in addition to the presence of the two families Zonuridæ and Gerrhosauridæ which are confined to it, than the Rain Forest, indicates that its fauna is a much older one. In fact, the South African savannahs must have been a center of evolution for reptiles during the late Mesozoic and the Tertiary, much as it probably was for the earlier reptiles of the Karoo formations. The Gerrhosauridæ, the Zonuridæ, the large group of degenerate skinks, and the numerous peculiar geckos must have reached their present degree of differentiation on the spot. The writer has avoided the attempt to define a distinct South African Subregion, in the sense of Sclater and Hewitt, on account of the difficulty in finding a definite boundary for it south of the Sahara. The extension of *Gerrhosaurus* and other typically South African genera into the Sudan and northward to Fritrea forbids the acceptance of the boundary proposed by Hewitt (1910, Ann. Transvaal Mus., II, p. 67) which would classify the Sudanese and Abyssinian Subprovinces with the Rain Forest, instead of with the much more closely related East and South African Subprovinces. The southward extension of the tropical fauna in eastern South Africa, consisting largely of genera common to the Rain Forest and East Africa, obscures the problem, as Hewitt has clearly recognized (*loc. cit*). The Savannah Province of the present discussion is an extension of Hewitt's South African subregion. But the writer does not believe in a South African and a Forest subregion because the "tropical" element (Agamidæ, Varanidæ, Amphisbænidæ, and (?) Lacertidæ), which Hewitt rightly regards as an invading fauna in South Africa, is quite as much an invasion in the Rain Forest. These groups which have arrived in Africa from the north in successive stages distinguish the continental from the Malagasy fauna. The relations of the Madagascan fauna are by no means exclusively with the primitive South African forms, the genera *Geodipsas* and *Diplodactylus*, for example, though absent in South Africa are present in both the Rain Forest and Madagascar, and in the poor development of chamæleons South Africa is rather less allied to Madagascar than East Africa.

Turning to the subdivision of the Savannah Province, the problem is much simplified. The Rain Forest has acted as a barrier cutting off the Sudanese Subprovince from South Africa, so that purely savannah species have entered it from the east only. The Ethiopian fauna here becomes attenuated, often with only one or two species (confined to the Sudan) of a genus highly developed elsewhere, as, for example, *Testudo*, *Lygodactylus*, *Ichnotropis*, *Gerrhosaurus*, *Prosymna*, *Psammophis*, *Aparallactus*, *Elapsoidea*, and *Atractaspis*. The genera confined to the Sudan are few, one turtle (*Cyclanorbis*), three lizards (*Hemitheconyx*, *Placogaster*, and (?) *Scincopus*), and two snakes (*Rouleophis* and *Chilorhinophis*). On the other hand the number of species confined to the Sudan is large but, with the exception of the above six genera, all the Sudanese species belong to genera whose zoöcenter is outside the province. There is a large Saharan element consisting of species of *Stenodactylus*, *Gymnodactylus*, *Tarentola*, *Agama*, *Acanthodactylus*, *Scincus*, and *Chalcides*. A small element in the fauna is distinctively Abyssinian or East African consisting of the genera *Bunocnemis*, *Latastia*, *Zamenis*, and *Scaphiophis*. The South African element has been mentioned above. Finally, a large number of forest reptiles range more or less widely into the Sudan. The Sudanese fauna, therefore, is the most composite of any of the subdivisions of the Savannah Province. Werner (1919, Denkschr. Akad. Wiss. Wien, XLVI, pp. 456–69) has given an excellent account of the fauna of the Eastern Sudan and fixed its northern boundary very accurately in this area.

The Abyssinian Subprovince, including Abyssinia, Somaliland, Eritrea, and southwest Arabia, exhibits a much greater degree of individuality. A number of southwest Asian genera reach Africa only in this area, *Pristurus* and *Contia* being excellent examples. *Pachycalamus*, *Parachalcides*, and *Ditypophis* are confined to the island of Socotra, whose fauna, while highly distinct in peculiar species, is closely related to the Abyssinian. Southwestern Arabia must be included with the Abyssinian Subprovince on account of the presence of the purely Abyssinian genera *Agamodon*, *Aporoscelis*, and *Philochortus*, together with other widespread but essentially African forms such as *Chamæleon*, *Atractaspis* and *Bitis*. The genera confined to this subprovince are the following:

LIZARDS

Holodactylus
Xenagama
Agamura
Pachycalamus
Philochortus
Parachalcides

SNAKES

Pseudoboodon
Æluroglena
Asthenophis
Ditypophis
Hemirhagerrhis
Brachyophis

Additional entogenic genera are *Pristurus*, *Hemidactylus*, *Latastia*, *Zamenis*, and *Micrelaps*. The ectogenic fauna is a composite one, a number of widespread Saharan species entering from the north, while an essentially Ethiopian element consisting of species of *Zonurus*, *Gerrhosaurus*, *Causus*, *Atractaspis*, and *Bitis* unite the area with the Savannah Province. It is noteworthy, however, that the entogenic fauna is only slightly related to the South and East African.

The East African Subprovince is poorly defined, and in the Botanical Map is united with the South African Subprovince, which corresponds with the line adopted by Hewitt (*loc. cit.*). Although characterized by only a few peculiar genera, of which the amphisbænian *Geocalamus* and the lacertid *Gastropholis* are the most important, the overlapping of the forest genera and the extraordinary development of the genus *Chamæleon* combine to give the East African fauna a moderately distinctive character.

The reptilian fauna of the South African Subprovince, of which the previous three are really appendages, has been thoroughly examined by Hewitt (*loc. cit.* and 1911, Rept. S. African Assoc. Adv. Sci., VII, p. 306). It is quite possible that some of the subdivisions of the huge area south of the Rain Forest and west of Lake Nyassa may prove to be fully equivalent in importance to the more northern subdivisions of the Savannah Province. A large number of genera are confined to this area:

TURTLES
Homopus

LIZARDS
Chondrodactylus
Ptenopus
Palmatogecko
Narudasia
Œdura
Homopholis
Colopus
Rhoptropus
Pseudocordylus
Platysaurus
Tropidosaura
Scapteira
Aporosaura
Tetradactylus
Cordylosaurus
Scelotes
Herpetosaura
Typhlacontias
Acontophiops
Typhlosaurus

SNAKES
Glypholycus
Ablabophis
Lamprophis
Micæla
Pythonodipsas
Apostolepis
Xenocalamus
Macrelaps
Hypoptophis
Limnonaja
Aspidelaps
Elaps

Below is a list of genera which overlap the East African or even the Sudanese and Abyssinian Subprovinces and which are entogenic in South Africa and highly characteristic of its fauna, the previous list being composed largely of genera of restricted distribution, while those of the following are "expanding" groups, apparently pushing northward, or groups which have entered from the north and undergone renewed differentiation in South Africa.

Lizards

- *Pachydactylus*
- *Zonurus*
- *Chamæsaura*
- *Nucras*
- *Ichnotropis*
- *Gerrhosaurus*
- *Sepsina*

Snakes

- *Pseudaspis*
- *Prosymna*
- *Homalosoma*
- *Amplorhinus*
- *Trimerorhinus*
- *Psammophis*
- *Amblyodipsas*
- *Calamelaps*
- *Aparallactus*
- *Elapsoidea*
- *Naja*
- *Causus*
- *Bitis*

The faunal subdivisions of the South African area proposed by Hewitt (*loc. cit.*) require much additional local work for their final delimination. It is singular that the extremely distinct Cape flora, characterized as a separate region by the botanists, does not carry with it a more distinct fauna. A large number of widely distributed species appear to be absent from this area. The deserts of the Kalahari have given rise to a distinctive fauna adapted to the desert habitat. The more tropical conditions of Natal admit a greater number of the widely spread central African forms (*Chirindia, Rhampholeon*) while still characterized by such essentially South African types as *Gerrhosaurus, Zonurus,* and the burrowing skinks. The most interesting area remaining for thorough exploration, which will contribute a decisive advance to our knowledge of African distribution, is the Katanga.

SQUAMATA

OPHIDIA

Typhlopidæ

TYPHLOPS Schneider

Typhlops punctatus (Leach)

Plate I, Figure 1

Acontias punctatus Leach, 1819, in Bowdich, 'Miss. Ashantee,' p. 493.

Typhlops punctatus (part) Boulenger, 1893, 'Cat. Snakes,' I, p. 42; 1896, III, p. 587; 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 209. Werner, 1907, Sitzber.

Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1863. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 365; 1917, XXIII, p. 8. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 18; 1920, Proc. Zoöl. Soc. London, p. 271. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 466.

It is impossible to disentangle the further bibliography of this species as understood in the present paper from the records of *punctatus* in the wider sense of Boulenger.

The collection contains fifteen specimens from the Sudan and the forest border: A. M. N. H. Nos. 11609–10 (April 1911), 11611, 11618–20 (January and October 1912), Faradje; 11612–13, 11614–17 (May and June 1912), Garamba; 11621–23 (August 1913), Poko.

There is no record of a *Typhlops punctatus* which is uniformly colored above and below from the Rain Forest; Boulenger's records of this form from the Lado, "Monbuttu," and French Guinea indicate that it ranges throughout the Sudanese Subprovince.

The characters regarded as distinguishing this species in the present restricted sense are: (1) color, dark gray above and below, with a light yellowish spot corresponding to each scale, producing a lineolate appearance; (2) scales about the body 26–30, mode 28; scales normally without reduction in number from a point 10 scales behind the rostral to the mid-body; scales about body at a point 10 scales in front of the anus, 22–28, 2–6 fewer rows than at mid-body; (3) size, small or moderate, maximum observed 433 mm.; length/diameter, 25–33; (4) edge of snout slightly more obtuse than in *congestus*, slightly sharper than in *intermedius;* (5) eye more distinct than in *intermedius*, at the point of the preocular; (6) distribution, Sudanese.

The reduction in number of scale rows from the count 10 scales behind the rostral (*a*) to the count at mid-body (*b*), and again between the mid-body and a point 10 scales before the anus (*c*) has been found a fairly constant and useful character. Thus in the present series there is no reduction in thirteen specimens between *a* and *b*, with a reduction of 2 rows in two specimens; the reduction between *b* and *c* is 2 in six specimens, 4 in seven, and 6 in two.

Measurements and Scale Characters

A. M. N. H. No.	Length	Diameter	L./D.	Scales *a*	*b*	*c*	Reduction *a–b*	*b–c*
11609	433 mm.	13 mm.	33	30	30	26	0	4
11610	306	12	25	30	30	26	0	4
11611	297	10	30	30	30	28	0	2
11612	198	7	28	28	28	24	0	4

A. M. N. H.				Scales			Reduction	
No.	Length	Diameter	L./D.	*a*	*b*	*c*	*a–b*	*b–c*
11613	195 mm.	7 mm.	28	28	28	22	0	6
11614	218	7	31	32	30	24	2	6
11615	112	4	28	28	28	26	0	2
11616	130	4	32	28	28	26	0	2
11617	239	9	27	28	26	24	2	2
11618	300	10	30	28	28	26	0	4
11619	280	9	31	28	28	26	0	2
11620	186	6	31	30	30	26	0	4
11621	308	10	31	28	28	24	0	4
11622	139	5	28	28	28	26	0	2
11623	288	10	29	26	26	22	0	4

Typhlops intermedius Jan

Typhlops liberiensis var. *intermedius* Jan, 1861, 'Icon. Gén. Ophid.,' I, No. 5, Pl. v, fig. 2, vi, fig. 2.

Typhlops punctatus (part) Boulenger, 1893, 'Cat. Snakes,' I, p. 42. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 595.

The correlation of the name *intermedius* of Jan with the present specimens is more doubtful than the identification of *punctatus* above, for there is little appearance of any relation with *congestus* (*liberiensis*), as is implied in the original description. The specimens placed under this heading by Boulenger, however, are from the Cameroon region; and this would give a logical forest distribution to the species.

There are twenty-two specimens in the collection with an additional one from the forest west of Fort Beni, presented to the expedition by Dr. Bequaert: A. M. N. H. No. 11632 (September 1913), Akenge; 11645 (1914), Fort Beni; 11626, 11627–29 (May and September 1910), 11636, 11637–39, 11640–44 (March, April and June 1914), Medje; 11630–31 (November 1910), Niangara; 11633–34, 11635 (November and December 1913), Niapu; 11624–25 (August 1909), Stanleyville.

Apparently very closely related to the preceding form, this species was not collected outside the limits of the Rain Forest; and, as the series is perfectly uniform, there seems to be no reason even for the subspecific classification. The writer regards it as the forest representative of *punctatus;* but lack of Gaboon and Cameroon material for comparison prevents any decision as to the relation of the western representatives.

The distinguishing characters are: (1) dark gray above, with a yellowish spot, corresponding to each scale (as in *punctatus, s. s.*), venter uniform yellow, pink in life; (2) scales at mid-body, 24–30, mode 26; reduction from *a* to *b* normally 0 (rarely 2), from *b* to *c*, 4 (2–6); (3) size moderate, maximum length 536 mm., length/diameter 28–43, i.e., more slender than *punctatus* and *congestus;* (4) form of snout as defined above, (hardly a useful character); (5) eye visible, much fainter than in *punctatus,* situated distinctly BELOW the upper point of the preocular; (6) distribution (probably) confined to the forest.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	Length	Diameter	L./D.	Scales *a*	*b*	*c*	Reduction *a–b*	*b–c*
11624	253 mm.	8 mm.	32	24	24	20	0	4
11625	170	5.5	31	24	24	18	0	6
11626	315	10	31	28	28	24	0	4
11627	372	12	31	28	26	22	2	4
11628	275	9	31	28	26	22	2	4
11629	395	13	30	26	27	24	+1	3
11630	413	10	41	26	26	24	0	2
11631	348	8	43	26	26	24	0	2
11632	292	9	32	28	26	21	2	5
11633	536	18	30	28	28	24	0	4
11634	384	13	29	26	26	22	0	4
11635	517	18	29	28	26	22	2	4
11636	402	13	31	26	28	23	+2	5
11637	398	11	36	26	26	22	0	4
11638	286	9	32	28	28	24	0	4
11639	316	9	35	26	26	22	0	4
11640	426	13	33	26	26	23	0	3
11641	317	11	28	26	26	22	0	4
11642	406	14	29	28	26	24	2	2
11643	460	14	33	28	28	24	0	4
11644	206	6	34	26	26	22	0	4
11645	472	17	28	30	30	26	0	4

Typhlops congestus (Duméril and Bibron)

Onychocephalus congestus DUMÉRIL AND BIBRON, 1844, 'Erpétol. Gén.,' IV, p. 334.

Typhlops punctatus (part) BOULENGER, 1893, 'Cat. Snakes,' I, p. 42. SJÖSTEDT, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 22. BOULENGER, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 209. WERNER, 1909, Mitt. Naturh. Mus. Hamburg, XXVI, p. 208. STERNFELD, 1910, 'Fauna Deutschen Kol.,' Reihe 3, Heft 2, p. 11. WERNER, 1913, Denkschr. Akad. Wiss. (math.-natur.), Wien, LXXXVIII, p. 717.

There are twenty-seven specimens referred to this form: A. M. N. H. Nos. 11648–51, 11652–63 (September and October 1913), Akenge; 11646–47 (September 1910), Medje; 11669–70 (May-June 1913), Niangara; 11664–67, 11668 (November and December 1913), Niapu; 11671–72 (August 1913), Poko.

Typhlops congestus may be regarded as the characteristic *Typhlops* of the Rain Forest, probably occurring throughout the botanical Forest Province in the forest islands along the streams. The East African records of Sternfeld (1910, p. 11) seem to refer in part to *congestus.*

As understood in the present paper, *congestus* may be characterized as (1) with a uniform brownish-yellow venter, dorsum dark brown, more or less invaded by the transverse flecks of the ventral color, or vice versa, the dorsal color may extend laterally onto the venter; there is never a sharp horizontal dividing line between the dorsal and ventral colors; (2) scales 24–32, mode 28, normal reduction from *a* to *b* 2 scale rows, 3 in 4 cases and 4 in 7; (3) size large, maximum observed 626 mm., length/diameter 20–32, average 23, accordingly much stouter than the two preceding forms; (4) angle of snout sharply defined, not rounded, though not produced into a cutting edge; (5) eye distinct, situated below the apex of the preocular; (6) confined (probably) to the forest province and to forest islands in East Africa.

Two specimens from Niangara (A. M. N. H. Nos. 11669 and 11670) differ from the normal *congestus* in being nearly uniformly mottled, the yellow slightly predominant below, the darker color above. Two from Poko (A. M. N. H. Nos. 11671 and 11672) are still more distinct in coloration, the yellow being reduced in one to a few yellow spots along the mid-ventral line, in the other to a single spot beneath the tail. These four specimens are somewhat more slender than the average and have a slightly different scale count. They differ radically from *T. punctatus,* however, and in the majority of characters are most satisfactorily located with *congestus.* They are probably hybrids of *congestus* with either *intermedius* or *lineatus.*

Measurements and Scale Characters

A. M. N. H.				Scales			Reduction	
No.	Length	Diameter	L./D.	*a*	*b*	*c*	*a–b*	*b–c*
11646	215 mm.	10 mm.	21	28	24	20	4	4
11647	302	13	23	30	28	22	2	6
11648	538	26	20	30	26	20	4	6
11649	578	23	25	30	28	22	2	6
11650	209	10	21	30	27	20	3	7
11651	225	11	20	32	28	22	4	6
11652	474	23	21	30	28	22	2	6
11653	464	23	20	30	28	22	2	6
11654	481	22	22	30	28	22	2	6
11655	466	22	21	30	28	22	2	6
11656	506	22	23	30	28	21	2	7
11657	452	18	25	28	26	19	2	7

Measurements and Scale Characters *(Continued)*

A. M. N. H.				Scales			Reduction	
No.	Length	Diameter	L./D.	*a*	*b*	*c*	*a–b*	*b–c*
11658	256	11	23	30	28	22	2	6
11659	547	23	24	30	26	22	4	4
11660	626	27	23	32	28	24	4	4
11661	367	15	24	31	28	22	3	6
11662	512	26	20	32	28	22	4	6
11663	528	21	25	30	28	22	2	6
11664	614	30	20	30	27	22	3	5
11665	258	12	21	30	28	22	2	6
11666	536	23	23	30	26	20	4	6
11667	448	22	20	32	28	22	4	6
11668	347	17	20	30	27	22	3	5
11669	536	20	27	34	32	26	2	6
11670	350	11	32	32	30	24	2	6
11671	605	23	26	34	32	26	2	6
11672	549	19	29	32	32	26	0	6

Typhlops tornieri Sternfeld

Typhlops tornieri Sternfeld, 1911, Mitt. Zool. Mus., Berlin, V, p. 69. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 615.

A single small specimen, A. M. N. H. No. 11673 (August 1909) from Stanleyville, is referable to this species.

This species has been recorded only from the Kilimandjaro. Its occurrence in the Ituri region therefore indicates a somewhat unusual range, but not without parallel (cf., for example, the distribution of *Gonatodes* or *Algiroides* among the lizards).

The specimen agrees well with the original description. The snout is rounded, prominent, without horizontal keel. Tail as broad as long, ending in a spine. Nostrils inferior. Inferior portion of the rostral narrower than the adjacent nasal, one-half the width of the head at its widest point above. Four upper labials, fourth largest. Nasal semi-divided, the cleft proceeding from the first labial, its posterior edge farther back than that of the rostral. Preocular about half as wide as the ocular. Ocular in contact with the third and fourth labials. The eye invisible, except at certain magnification and lighting, when it is seen to be below the apex of the preocular. Seven enlarged superior head shields, the prefrontal largest. Supraocular two-thirds as long as high. Scales 26–26–20. Length 198 mm., diameter 7 mm., contained into the length 28 times.

Coloration in life, pale greenish gray above, chin and throat pinkish, venter yellowish white. The darker color above is due to the progressive darkening of the borders of the scales, so that the dorsum is faintly lineolate, as in *Typhlops punctatus*.

Typhlops avakubæ, new species

Typhlops cæcus appears to give off a related form in the Ituri forest, of which three specimens were collected: A. M. N. H. No. 11674 (April 1914), Avakubi; 11675 (June 1914), Medje; 11676 (tag corroded), Belgian Congo.

This may be one of the forms confined to the forest; the distribution of the related *cæcus* is not characteristic (Sierra Leone to Gaboon) although the record of Tornïer for East Africa has been dropped by Sternfeld. In any case, the species in the Sudanese area reached by the Congo expedition is a very distinct one.

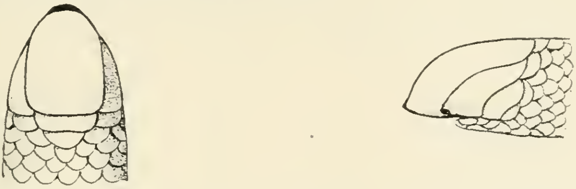


Fig. 1. Dorsal and lateral views of head of *Typhlops avakubæ*, new species, (11674, type, × 4).

Diagnostic Characters

Habitus of *Typhlops cæcus;* 24 scales about the body; rostral and nasal much more elongate, produced posteriorly; preocular emarginate behind; ocular and subocular small. Eye invisible.

Detailed Description

Type.—A. M. N. H. No. 11674.

Body elongate, diameter contained into length 74 times. Head slightly depressed, set off from body. Snout with a sharp cutting edge, which is produced into a horny translucent ridge, rounded in outline from above. Tail as long as broad. Inferior portion of the rostral broader than long; upper part produced backwards, nearly the full width of the head. Nasal semidivided, the cleft proceeding from the first labial, leaving a narrow strip parallel with the edge of the rostral; nostril adjacent to rostral; nasal produced backwards as far as the rostral, narrow above. Preocular emarginate behind, followed by a very small ocular; eye invisible. Prefrontal transverse; other upper head shields not enlarged. Scales about body 24. Length 370 mm., diameter 5 mm.

Comparison of Paratypes

The two paratypes exhibit the same arrangement of the head shields, and have 24 scales about the body. The body is much stouter, however, the proportions being 320 mm. with a diameter of 6 in No. 11675, 380 mm. with a diameter of 7 mm. in 11676.

Typhlops sudanensis, new species

Six specimens from the Sudan represent a very distinct species. A. M. N. H. Nos. 11677–81 (November 1911), Faradje; 11682 (June

1912), Garamba. Probably a species of the Sudanese Subprovince, related to *crossii* in Nigeria and *somalacus* in northeast Africa.

Diagnostic Characters

Body very slender, diameter contained in length 54 to 81 times. Rostral very large with a sharp cutting edge. A very large nasal covering most of the side of the head, nostrils interior; nasal cleft proceeding from the second labial, not extending beyond nostril, the anterior lobe wide. Ocular, preocular, and subocular small.

Detailed Description

Type.—A. M. N. H. No. 11677.

Body elongate, length/diameter 59, tail as long as broad. Scales about the body 26–24–24. Rostral very large, more than half the width of the head above, extending well backwards, with a sharp cutting anterior edge. Nasal very large, nostrils inferior; nasal semidivided, the cleft proceeding from the second labial, the anterior lobe being narrower. Following the nasal is a small plate which may be called the preocular, in contact below with the second and third labials. The upper corner of the preocular overlaps the slightly smaller ocular, which is separated from the prefrontal by a small supraocular and from the labials by a small subocular, the latter in contact with the fourth labial, narrowly separated from the third. Prefrontal transversely elongate, narrow, other head shields not enlarged. Length 469 mm., diameter 8 mm.

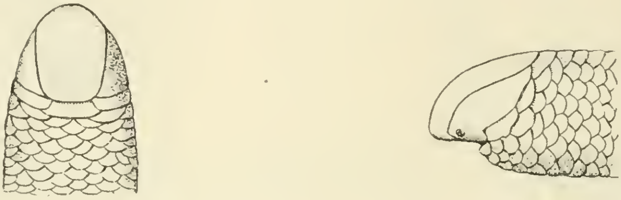


Fig. 2. Dorsal and lateral views of head of *Typhlops sudanensis*, new species, (11677, type, × 4).

The entire body is uniform light yellowish brown, pink in life.

Comparison of Paratypes

The paratypes exhibit slight variations. The position of the nasal cleft may be more posterior so that the two lower lobes of the nasal are nearly equally wide. The scales about the body are 24 at the middle in all. The measurements are tabulated below.

Measurements

A. M. N. H. No.	Length	Diameter	Length/Diameter
11677 (type)	469 mm.	8 mm.	59
11678	406	5	81
11679	443	7.5	59
11680	451	7	64
11681	277	3.5	79
11682	172	3	57

"These blindworms have been dug by workmen from under a hillock, about 5 feet below the surface of the ground. They are pinkish in color, the smaller specimens superficially resembling earthworms" (H. Lang).

Leptotyphlopidæ

LEPTOTYPHLOPS Fitzinger

Leptotyphlops nigricans (Schlegel)

Typhlops nigricans SCHLEGEL, 1844, 'Abbild. Amphib.,' p. 38, Pl. XXXII, figs. 21–24.

Glauconia nigricans BOULENGER, 1893, 'Cat. Snakes,' I, p. 67; 1902, Proc. Zoöl. Soc. London, II, p. 17. ROUX, 1907, Zool. Jahrb. (Syst.), XXV, p. 733. GOUGH, 1908, Ann. Transvaal Mus., I, p. 20. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, IV, p. 246. BOULENGER, 1910, Ann. S. African Mus., V, p. 499; 1915, Proc. Zoöl. Soc. London, p. 198. CHABANAUD, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 367; 1917, XXIII, p. 10.

A single specimen from Beni, A. M. N. H. No. 11683 (August 1914), of this species, has been presented to the collection by Dr. J. Bequaert.

This record is a northward extension of the range of the species in East Africa. It has previously been known from South Africa, reaching northern Rhodesia. Chabanaud (1916, p. 367), however, records it from Dahomey, indicating a possible extension throughout the Savannah Province.

The specimen is coiled and preserved in strong alcohol and, while readily identified with this species, is not measurable.

Boidæ

Pythoninæ

PYTHON Daudin

Python sebæ (Gmelin)

Plate I, Figure 2

Coluber sabæ GMELIN, 1788, 'Syst. Nat.,' I, p. 1118.

Python sabæ BOULENGER, 1893, 'Cat. Snakes,' I, p. 86; 1896, III, p. 592. MOCQUARD, 1896, Bull. Mus. Hist. Nat., Paris, II, p. 59. BOULENGER, 1897, Proc. Zoöl. Soc. London, p. 800; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 278. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. SJÖSTEDT, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 23. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 67. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 134. FLOWER, 1900, Proc. Zoöl. Soc. London, p. 968. BOULENGER, 1902, in Johnson, 'Uganda Protectorate,' p. 446. JOHNSTON, 1902, 'Uganda Protectorate,' pp. 94, 409. LAMPE, 1902, Jahrb. Nassau. Ver. Naturk., LV, p. 9. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 343. BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 42. BOULENGER, 1907, Proc. Zoöl. Soc. London, p. 255; Ann. Mus. Stor. Nat. Genova, (3) II, p. 211; Mem. Proc. Manchester Lit. Philos. Soc., LI, No. 12, p. 10. JOHNSTON, 1906, 'Liberia,' II, p. 813. WERNER, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1865. Gough, 1908, Ann. Transvaal Mus., I, p. 20. Johnston, 1908, 'George Grenfell and the Congo,' p. 950. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 403; IV, pp. 239, 243, 246. Chubb, 1909, Proc. Zoöl. Soc. London, p. 595. Sternfeld, 1909, 'Fauna Deutschen Kol.,' (1), Heft 1, p. 9; (2), Heft 1, p. 9; (3), Heft 2, p. 13; (4), Heft 1, p. 14. Boulenger, 1910, Ann. S. African Mus., V, p. 500. Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 14. Peracca, 1910, Boll. Mus. Torino, XXV, No. 624, p. 3. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 164. Lönnberg, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 21. Peracca, 1912, Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 4. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 161. Müller, 1913, Zool. Anz., XLI, p. 234. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 199, 617, 644. Breijer, 1915, Ann. Transvaal Mus., V, p. 113. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 368. Loveridge, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 334. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 19; 1920, Proc. Zoöl. Soc. London, p. 274. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 467.

Eighteen specimens of *Python sebæ* were collected: A. M. N. H. No. 11697 (September 1912), 11698 (December 1914), Avakubi; 11689–90 (February 1911), 10087, 11691–95 (March 1911), 11696 (September 1912), Faradje; 11686 (January 1910), Gamangui; 11687–88 (March and July 1910), 10088, Medje; 11684–85 (August 1909), Stanleyville.

Python sebæ is one of the most widely distributed of African snakes. Its range is to a certain extent independent of the Rain Forest, forest specimens from Medje being indistinguishable from the Sudanese. The species also enters the forest in Liberia and Cameroon, but is more frequently recorded from the Savannah Province.

No important variation is observable in the present series. The greatest length is reached in a specimen of 4880 mm., and there appears to be no distinction in size between forest and Sudanese specimens. The tail length approximates a tenth of the total.

There is, of course, much instability in the form and number of the head shields, especially the prefrontals and parietals, but these are usually symmetrically arranged. The number of scales in the loreal region varies from 8 to 16, and the scales in the ocular ring, exclusive of the supraoculars, are 5 to 9. Upper labials are 11 to 15, lower 19 to 24. The ventrals vary from 270 to 284, the subcaudals from 65 to 69. The dorsal scale formula varies from 66–89–43 to 77–95–54.

The color pattern of the back is highly variable, while that of the head seems to be perfectly constant. The top of the head is dark, with a straight light stripe from the supranasal over the nostril and eye on each side to the temporal region. The labial border, except posteriorly, is light, connected with the supraocular stripe on the neck, and anteriorly by a broad light area below the nostril and on the anterior labials and rostral. This area encloses a dark spot on the first and second labials. There are two distinct subocular light lines, one from the posterior lower corner to the ninth to twelfth labial, one from the lower anterior corner across the sixth labial. There is a median light mark behind the parietals.

The light supraocular line continues dorsolaterally as the boundary between the lighter coloration of the sides and the darker median part of the back. This dark color is crossed (usually) by transverse light bands, connecting the ground color of the sides for the anterior sixth of the length. Behind this the dark spots become confluent at their corners, enclosing more or less transverse light areas which are narrower (longitudinally) than the dark, forming the line $\overline{O}$ of Zenneck. The transverse dark markings tend to widen on the vertebral line, and this may be carried to the extent of forming, for short distances, a third longitudinal dark line, $\overline{R}$ of Zenneck. Posteriorly the light interspaces may increase longitudinally toward the tail, and the tail itself has always a sharply defined median light band. There may be subsidiary small light spots enclosed by the dark crossbars at their (lateral) ends, especially posteriorly. The general color of the sides is lighter with irregular, more or less vertical, dark spots which anteriorly form semicircles, and further back 3 shaped markings, the open side cephalad. On the posterior sixth of the body these marks become straighter, and join the dark color of the back above. The lateral dark spots are sharply defined behind, but merge gradually into the ground color in front. Venter mottled, the light color predominant on the median line.

"Stomach contents of No. 11686, a rat. No. 11688 had swallowed a female antelope measuring 1040 mm. in length and 480 mm. high at the shoulder. Pythons are eaten extensively by the natives. They are often caught by means of traps set at their holes. The pythons hereabouts have the habit of taking refuge in holes, often large excavations, in former termite hills, simply to sleep. During the rainy season the natives follow their tracks, and if they find the retreat a noose is at once set in front of the hole. The snake is usually caught behind the neck. The natives also spear them" (H. Lang).

Python regius (Shaw)

Boa regia Shaw, 1802, Zoölogy, III, p. 347, Pl. xcvi.

Python regius Boulenger, 1893, 'Cat. Snakes,' I, p. 88. Mocquard, 1896, Bull. Mus. Hist. Nat., Paris, II, p. 59. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX,

p. 145; 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1865. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 403; 1909, 'Fauna Deutschen Kol.,' (1), Heft 1, p. 9; (2), Heft 1, p. 9. BOULENGER, 1915, Proc. Zoöl. Soc. London, p. 644. WERNER, 1919, Denkschr. Akad. Wiss. Wien, math.-natur. Kl., XLVI, p. 502. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 274.

A single specimen, A. M. N. H. No. 11699, of *Python regius* was taken by the expedition at Aba, in July 1911.

This species, smaller and less aggressive than *Python sebæ,* appears to be restricted to the Sudanese Subprovince. *Python anchietæ* Bocage is too little known to lend itself to discussion of range, but it may well be found to reach the Katanga district when this is better explored. In fact, one of the chief zoögeographic problems of Africa depends on the study of the eastern area south of the forest. The region from Angola to Tanganyika may constitute a subprovince more nearly equivalent to the Sudanese than is at present evident, though there is a considerable element in the Angolan fauna which is independent of the South African fauna proper.

The specimen in hand measures 401 mm., the tail, 27 mm., constituting .07 of the total. The scales are 56–55–40, the ventrals 205, the subcaudals 28. The labials 11–16, the plates in the loreal region 11–12, in the ocular ring (excluding the single supraocular) 8–9. Labial pits 4 on each side + 1 on each side of the rostral.

In color pattern *regius* is widely distinct from both *sebæ* and *anchietæ.* The head is marked above very similarly but laterally it lacks the anterior light subocular stripe, and also the dark spot on the first and second labials of *sebæ.* The dark mark of the top of the head gives off from each of its posterior corners a sharply defined black band, 2–6 scale rows wide, these longitudinal bands separated by from 3 to 10 scale rows, and confluent at irregular intervals by crossbands which vary in width (longitudinally) from 3 to 10 scale rows, equalling or exceeding the light spaces in some cases, but usually less. Laterally the dorsolateral dark line gives off vertical crossbars, which frequently fork and sometimes reunite. These are irregularly spaced, much narrower than the light spaces of ground color between them, and in the latter, at the level of the 15th scale row, there is a row of small dark spots. Zenneck's homology between the longitudinal dark lines of *regius* and those of *sebæ* is of interest; but a single specimen does not offer a valid basis for discussion. It is true in any case that the posterior parts of the body are most similar in color pattern.

CALABARIA Gray

Calabaria reinhardtii (Schlegel)

PLATE II

Eryx reinhardtii SCHLEGEL, 1848, Bijdr. tot de Dierk., I, p. 2, Pl.

Calabaria reinhardtii BOULENGER, 1893, 'Cat. Snakes,' I, p. 92. BOCAGE, 1895, 'Herpétol. Angola,' p. 74. BOULENGER, 1896, 'Cat. Snakes,' III, p. 592. MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 8. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 134. BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 451. TORNIER, 1901, Zool. Anz., XXIV, p. 63. BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 42. BOULENGER, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 211. JOHNSTON, 1906, 'Liberia,' II, p. 812; 1908, 'George Grenfell and the Congo,' p. 950. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 403; 1909, 'Fauna Deutschen Kol.,' (1), Heft 1, p. 9. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 595. BOULENGER, 1915, Proc. Zoöl. Soc. London, p. 199; 1919, Rev. Zool. Africaine, VII, p. 19; 1920, Proc. Zoöl. Soc. London, p. 274.

Twenty-five specimens of *Calabaria* were collected: A. M. N. H. No. 11708 (February 1910), Gamangui; 11700–01 (September 1910), 11702–03, 11709 (March 1910), 11704 (May 1910), 11705 (August 1910), 11706–07 (September and October 1910), 11717 (April 1914), 11718–19 (June 1914), 11720–22 (July 1914); Medje; 11710–13 (November 1913), 10090, 11714–16 (December 1913), Niapu; 11723 (tag corroded), Belgian Congo.

The distribution of *Calabaria* coincides with the Forest province, and it appears to be confined to the continuously forested area, occurring in both the eastern and western divisions and unrecorded from Togo. It is therefore one of the genera most useful in the characterization of the zoögeographical subdivisions of the Ethiopian Region.

The maximum length is reached by a specimen of 916 mm. The tail length averages .08 of the total. The sexes are not readily distinguished by the form of the tail, but the claws at each corner of the base are externally visible only in the males. There are normally 3 pairs of shields between the frontal and large rostral. On eight specimens an azygous prefrontal is added, and in one specimen there are two azygous shields. There is uniformly a single preocular and two supraoculars. The postoculars are normally 2 on each side, 2–3 in three specimens, 3–3 in one. The temporals are 3 or 4 in the first row, 4 or 5 in the second. Upper labials 8, third and fourth entering the eye, or frequently the fourth only, third and fourth fused in one specimen, lower labials 9–11.

The scale formula lies between 28–35–28 and 25–32–25. The normal scale count appears to be 28–33–27. The ventrals number from 221 to 234, and the subcaudals from 19 to 27.

"The general color is dark brown with irregular lighter markings. These become yellowish pink on the sides, and the venter is brown, marked with pink. Tip of head and tail nearly black. Some specimens have a milky white band around the tail about 20 mm. from its tip, still further increasing its superficial resemblance to the head. Iris brown, pupil vertically elongate. No. 11709 had swallowed a mouse, which was disgorged before injection. Specimens were taken crawling about in the forest among the moist dead leaves. This snake nearly always holds its head vertically downward, as if trying to burrow; the tip of the tail is often held away from the ground, and, in contrast to the immovable head, is slightly moved to and fro. When seriously annoyed it rolls itself into a compact ball, the head in the center, which it is very difficult to straighten out. It never tries to bite. The natives believe that it has two heads, and are much afraid of it" (H. Lang).

Colubridæ

Colubrinæ

NATRIX Laurenti

Natrix olivaceous (Peters)

Coronella olivacea PETERS, 1854, Monatsber. Akad. Wiss. Berlin, p. 622.

Tropidonotus olivaceous BOULENGER, 1893, 'Cat. Snakes,' I, p. 227; 1896, III, p. 604; Proc. Zoöl. Soc. London, p. 216. PERACCA, 1896, Boll. Mus. Torino, XI, No. 255, p. 2. BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 278; Proc. Zoöl. Soc. London, p. 801. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 8. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 67. BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 451. FLOWER, 1900, Proc. Zoöl. Soc. London, p. 968. BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 446; 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 112; 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, No. 12, p. 10. ROUX, 1907, Rev. Suisse Zool., XV, p. 76. WERNER, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1866. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 404; IV, pp. 211, 243. WERNER, 1908, 'Rept. Wellcome Res. Lab. Khartoum,' p. 170. BOULENGER, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 303; 1910, Ann. S. African Mus., V, p. 503. NIEDEN, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 442. PERACCA, 1910, Boll. Mus. Torino, XXV, No. 624, p. 3. ROUX, 1910, Rev. Suisse Zool., XVIII, p. 98. STERNFELD AND NIEDEN, 1911, Mitt. Zool. Mus. Berlin, V, p. 385. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 265. BOETTGER, 1913, 'Wiss. Ergeb. Reise in Ostafrica, Voeltzkow,' III, p. 347, 353. WERNER, 1913, Denkschr. Akad. Wiss. (math.-natur.), Wien, LXXXVIII, p. 717. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 210, 619, 645. LOVERIDGE, 1916, Journ. E. Africa Uganda Nat. Hist. Soc., V, No. 10, p. 77. CHABANAUD, 1916, Bull. Mus. Hist. Nist., Paris, XXII, p. 368; 1917, XXIII, p. 10. LOVERIDGE, 1918, Journ. E. Africa

Uganda Nat. Hist. Soc., No. 13, p. 334. Chabanaud, 1919, Bull. Mus. Hat. Nat., Paris, p. 567. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 19; 1920, Proc. Zoöl. Soc. London, p. 276.

Twelve specimens, of two color phases, were collected as follows: A. M. N. H. Nos. 11913–15, 11916 (April and June 1914), Medje; 11912 (June 1913), Niangara; 11911 (August 1913), Poko; 11903–05 (August 1909), 11906–08 (April 1915), Stanleyville.

The occurrence of this widely distributed savannah species in the forest is paralleled by the distribution of a few other forms, such as *Causus rhombeatus*, but in general the penetration of the forest by savannah species is much less frequent than the spreading of forest species out into the savannah. *Natrix olivaceous* has not been taken from the Cameroon forest, and the present records appear to represent recent invasions along the rivers, the specimens taken at Medje resembling those from Poko and Niangara north of the forest, while the specimens from Stanleyville are very distinct and at first sight appear to represent a distinct form. These have probably entered the forest from the south. The few records from Gaboon probably represent specimens which have spread north—from the Lower Congo, where it is well known.

The six specimens from Stanleyville are brownish above, with a dark brown vertebral band four scales in width, more or less distinctly outlined with light dots, and faint traces of a lateral band on the third scale row, also outlined with a row of small white dots. This coloration has been described in specimens from Kissenje by Sternfeld (1912, p. 265) "Querbinden" being evidently a *lapsus*. The venter is entirely yellowish white. In two specimens the ground color is a distinctly reddish brown. Upper labials white or white with narrow black borders.

In the remaining six specimens, the dorsum is a uniform bluish black, extending onto the lateral ends of the ventrals, leaving only the middle half of the venter light. The posterior borders of the ventral shields are more or less edged with black in addition. The upper labials are white, heavily edged with black, and the sutures of the lower labials are narrowly marked with black.

These two colorations are correlated with the extremes in the variation of ventral plates and subcaudals, and the comparison of larger series would be of interest. Unfortunately the tail has been injured in seven of the twelve specimens under examination. The relations may be set forth as follows, both sexes being represented in each color phase:

Coloration	Venter immaculate Dorsum banded, brownish or reddish	Ventrals with black tips Dorsum uniform bluish black

Ventral Plates	133–137	142–149
Subcaudals	61– 70	85
Locality	Stanleyville Kissenje	Medje Poko Niangara

Hydræthiops Günther

Hydræthiops melanogaster Günther

Plate III, Figure 1

Hydræthiops melanogaster Günther, 1872, Ann. Mag. Nat. Hist., (4) IX, p. 28, Pl. iii, fig. G. Boulenger, 1893, 'Cat. Snakes,' I, p. 281; 1896, III, p. 610. Günther, 1896, Ann. Mag. Nat. Hist., (6) XIX, p. 264. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 12. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 451; 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 211. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 404. Gendre, 1909, Extr. C. R. Soc. Linn. Bordeaux, p. cvi. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 201; 1919, Rev. Zool. Africaine, VII, p. 19; 1920, Proc. Zoöl. Soc. London, p. 276.

Fifty-two specimens of *Hydræthiops melanogaster* were collected: A. M. N. H. No. 11923 (October 1909), 11964 (March 1911), Avakubi; 11922, 11960 (April 1914), 11961–63 (June 1914), Medje; 11918–19, 11924–32 (November 1910), Niangara; 11920, 11933–35, 11937–47 (November 1913), 11921, 11948–54, 11956, 11965, 12021 (December 1913), 11955, 11957–59 (January 1914), Niapu; 11917, 11936, 12314 (tags corroded), Belgian Congo.

This species is confined to the Rain Forest and its environs.

The large series proves very uniform in scale characters. The largest male measures 546 mm., the largest female 712 mm. The proportionate tail length is .18–.21, mean .20 in males, .15–.21, mean .18 in females. The ventrals range from 146–156 in males, mean 152, 148–155 in females, mean 151. Subcaudals 51–57, mean 55 in males, 47–55, mean 50 in females. The dorsal scales vary from 23–23–21 to 27–27–23, the higher counts in females, the lower in males, 25 the most frequent number at mid-body in both sexes. One preocular, and two postoculars (rarely one). Temporals one anteriorly, occasionally two; two to four in the second row. Upper labials 9–12, lower 10–13.

The dorsum is grayish brown, lighter on the sides, the skin between the scales lighter. The venter and the first part of the second scale rows are black. An ill-defined light line extends from the angle of the mouth along the sides for a short distance in juvenile specimens. Upper labials black. Obscure dark markings are observable on the back in a few specimens, which are arranged regularly in five longitudinal rows.

The stomach contents of three specimens consist of fish remains, one recognizable as a catfish. One stomach contained a tadpole, and another a mass of mud, with a little vegetable matter, probably the stomach contents of the snake's victim.

A specimen taken in December 1913, contains 6+7 eggs, measuring 20×28 mm.

BOTHROPHTHALMUS Peters

Bothrophthalmus lineatus Peters

Elaphis (Bothrophthalmus) lineatus PETERS, 1863, Monatsber. Akad. Wiss. Berlin, p. 287.

Bothrophthalmus lineatus BOULENGER, 1893, 'Cat. Snakes,' I, p. 324. BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 83. BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 278. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 135. TORNIER, 1901, Zool. Anz., XXIV, p. 64. BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 446. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 343. BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 42. JOHNSTON, 1906, 'Liberia,' II, p. 832. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 405. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 596. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 164. DESPAX, 1911, in Cottes, 'Mission Cottes au Sud Cameroun,' p. 239. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 201, 619; 1919, Rev. Zool. Africaine, VII, p. 19; 1920, Proc. Zoöl. Soc. London, p. 276. CHABANAUD, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 467.

Bothrophthalmus lineatus olivaceous MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., p. 597.

Thirty-seven specimens of *Bothrophthalmus lineatus* were collected by the Congo Expedition: A. M. N. H. Nos. 12540, 12547 (September 1913), 12548 (October 1913), Akenge; 12529 (October 1909), 12530 (December 1913), 12569 (March 1914), Avakubi; 12531 (February 1910), Gamangui; 12532–33, 12534, 12535 (April, August and September 1910), 12554–59, 12560–64, 12565–68 (April, June and July 1914), Medje; 12536, 12537 (November and December 1910), 12538 (March 1913), Niangara; 12549, 12550–53 (November and December 1910), Niapu; 12539 (August 1913), Poko; 12397–98 (August 1909), Stanleyville.

Bothrophthalmus lineatus is widely distributed throughout the Rain Forest, reaching Uganda, Nyangwe and the Kassai on its borders.

The series is very uniform, and none of the variations in color pattern described in West African specimens appear. The largest male measures 945 mm., the largest female 1135 mm. The proportionate tail length in males is .19–.24, mean .21, in females .17–.20, mean .18. Ventrals number from 181–198, mean 191, in males; 186–207, mean 197, in females; subcaudals in males 75–85, mean 80, in females 70–81, mean 74.

The dorsal scale rows are extremely constant, 23–23–21, only four specimens deviating from this count, 3 with 19 posteriorly, and one with 21 anteriorly. Two pre- and two postoculars in every specimen, three postoculars on one side in a single instance. Temporals 2–3, 3–3 in one specimen. Seven upper and seven lower labials, rarely 6 or 8 below.

The coloration is extremely distinctive. The venter is light yellowish red, often vermilion in life, darker on the throat, and extending onto the first scale row. The dorsum is a glistening black, with five bright red longitudinal lines (yellow in alcoholic specimens): a narrow vertebral line on the middle of the median scale row, a slightly wider one on each side on the upper half of the sixth and lower half of the seventh rows, and a still broader one on the second and third rows. Below this the remaining black consists of a narrow line on the upper part of the first and lower part of the second scale rows. The median red line disappears half-way down the tail; the outer lateral lines join the ventral color on the base of the tail; and the dorsolateral lines continue to the end of the tail, though faint. The top of the head is light brown, somewhat darker in adult specimens, sharply distinct from the black dorsum, extending back about two scales behind the parietals. The median and lateral red lines join this light head color, while the dorsolateral lines end abruptly in the black, though occasionally they also merge with the head color. The head is marked with a black V, the apex anterior, with small black spots on the parietals, and a black line on the canthus rostralis through the eye, with considerable variation in the details of the pattern.

The form found in Fernando Po and Cameroon, which lacks the dorsal lines of the more widely distributed typical form, may be distinguishable as a subspecies, *Bothrophthalmus lineatus brunneus* Günther.

Four specimens contained young rats, and others had evidently disgorged similar prey, from the hair found in their mouths.

Two specimens, taken in July 1914, contained five large eggs, 2+3, 19×37 mm., and 20×45 mm., respectively.

BOTHROLYCUS Günther

Bothrolycus ater Günther

Plate IV, Figure 1

Bothrolycus ater GÜNTHER, 1874, Proc. Zoöl. Soc. London, p. 444, Pl. LVII, fig. B. BOULENGER, 1893, 'Cat. Snakes,' I, p. 326; 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 212. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 405. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 597. BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 19; C. R. Acad. Sci. France, CLXVIII, p. 666; 1920, Proc. Zoöl. Soc. London, p. 277.

Pseudoboodon albopunctatus ANDERSSON, 1901, Bihang Svenska Vetensk.-Akad. Handl., XXVII, part 4, No. 5, p. 6, Pl. I, figs. 2–4.

Bothrolycus albopunctatus Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 405.

Twelve specimens of this interesting species were collected as follows: A. M. N. H. No. 11968 (October 1913), Akenge; 11966–67 (January 1913), Faradje; 11969–72, 11973–77 (November and December 1913), Niapu.

Müller (1910, p. 597) has satisfactorily explained the synonymy of this species as based on its sexual dimorphism, and the present series confirms his conclusions. The distribution appears to be closely confined to the forest.

In the six males the largest measures 440 mm., and the largest of six females measures 702 mm. The tail length in males ranges from .13–.18 of the total; in females it is .08 of the total. The ventrals range from 139–144 in males, and from 148–152 in females; subcaudals 30–33 in males, 18–21 in females. The dorsal scales are 17–17–15 in males, 19–19–15 in females. One preocular, two postoculars, and temporals 1–2 in all specimens. Eight upper labials, the third, fourth, and fifth entering the eye; eight lower labials, the first four in contact with the anterior chin shields.

The difference between the sexes is unusually pronounced, the difference in size being quite exceptional. The maximum length recorded for a male is 461 mm., (Müller, 1910, p. 598), the maximum for females 702 mm.; the mean length of six males being 378 mm., of six females, 631 mm.

The coloration is dark gray, with brownish venter; white spots on the ends of the ventral plates, and often a "dusted" appearance on the dorsal scales. Two of the males have the top of the head white with dark spots. Further variation has been described by Müller (1910, p. 598).

BOÆDON Duméril and Bibron

Boædon lineatus Duméril and Bibron

Boædon lineatum Duméril and Bibron, 1854, 'Erpétol. Gén.,' VII, p. 363.

Boædon lineatus Mocquard, 1896, Bull. Mus. Hist. Nat., Paris, II, p. 59.

Boodon lineatus Boulenger, 1893, 'Cat. Snakes,' I, p. 332; 1896, III, p. 616. Bocage, 1896, Jorn. Sci. Lisboa, (2) VI, pp. 77, 91. Boulenger, 1896, Proc. Zoöl. Soc. London, p. 216; Ann. Mus. Stor. Nat. Genova, (2) XV, p. 13; (2) XVI, p. 553; (2) XVII, p. 20; 1897, Proc. Zoöl. Soc. London, p. 801; Ann. Mag. Nat. Hist., (6) XIX, p. 278. Johnston, 1897, 'British Central Africa,' p. 361*a*. Peracca, 1897, Boll. Mus. Torino, XII, Nos. 273, 304. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 68. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 398. Boulenger, 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 720. Ferreira, 1898, Jorn. Sci. Lisboa, (2) V, p. 244. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 147. Boulenger, 1902, in Johnston, 'Uganda

Protectorate,' p. 446; Proc. Zoöl. Soc. London, II, p. 17. LAMPE, 1902, Jahrb. Nassau Ver. Naturk., LV, p. 17. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 334, 339, 343. BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 54. FERREIRA, 1903, Jorn. Sci. Lisboa, (2) VII, p. 10. PERACCA, 1904, Boll. Mus. Torino, XIX, No. 467. BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, pp. 112, 180; Ann. Mus. Stor. Nat. Genova, (3) II, p. 211. FERREIRA, 1905, Jorn. Sci. Lisboa, (2) VII, p. 114; 1906, p. 167. BOULENGER, 1907, Proc. Zoöl. Soc. London, p. 486. ROUX, 1907, Zool. Jahrb. (Syst.), XXV, p. 734; Rev. Suisse Zool., XV, p. 76. WERNER, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1867; 1908, 'Rept. Wellcome Res. Lab. Khartoum,' p. 170. BOULENGER, 1908, Ann. Natal Mus., I, p. 228. GOUGH, 1908, Ann. Transvaal Mus., I, p. 22. OHDNER, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 5. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 405; IV, pp. 212, 243. BOULENGER, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, pp. 303, 309, 311. CHUBB, 1909, Proc. Zoöl. Soc. London, p. 595. BOULENGER, 1910, Ann. S. African Mus., V, p. 505. LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 14. NIEDEN, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 442. PERACCA, 1910, Boll. Mus. Torino, XXV, No. 624, p. 3. ROUX, 1910, Rev. Suisse Zool., XVIII, p. 99. STERNFELD, 1910, Mitt. Zool. Mus. Berlin, V, pp. 54, 63. WERNER, 1910, Denkschr. Med. Naturw. Ges. Jena, XVI, p. 355. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 164. STERNFELD, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 250. STERNFELD AND NIEDEN, 1911, Mitt. Zool. Mus. Berlin, V, p. 385. PERACCA, 1912, Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 5. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 266. BOETTGER, 1913, 'Wiss. Ergeb. Reise in Ostafrika, Voeltzkow,' III, pp. 348, 355, 363, 367. HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 161. LÖNNBERG AND ANDERSSON, 1913, Ark. Zool., Stockholm, VIII, No. 20, p. 2. NIEDEN, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 450. WERNER, 1913, Denkschr. Akad. Wiss. (math.-natur.), Wien, LXXXVIII, p. 717. BOULENGER, 1915, Proc. Soc. Zoöl. Soc. London, pp. 202, 619, 646; LOVERIDGE, 1916, Journ. E. Africa Uganda Nat. Hist. Soc., V, No. 10, p. 77; 1918, No. 13, p. 333. BOULENGER. 1919, Rev. Zool. Africaine, VII, p. 20. WERNER, 1919, Denkschr. Akad. Wiss. Wien, math.-naturw. Kl., XLVI, p. 502. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 277. CHABANAUD, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 467.

Boaodon lineatus CHABANAUD, 1916, Bull. Mus. Nat. Hist., Paris, XXII, p. 368; 1917, XXIII, pp. 10, 139.

Four specimens were collected: A. M. N. H. No. 12313 (August 1915), Banana; 12312 (July 1915), Malela; 12310–11 (July 1915), Zambi; all three localities in the Lower Congo. Two specimens from Rhodesia with a third from the Natal Museum were available for comparison.

This species occurs throughout the Savannah Province, but was not taken in the Uelle District by the Congo Expedition.

The specimens from the Lower Congo are juvenile, the largest measuring 435 mm. The tail length in the single male is .18 of the total,

.13–.14 in the three females. Ventrals 202 in the male, 220–222 in the females, subcaudals respectively 67 and 52–53. Dorsal scale rows 23–27–19. One preocular and two postoculars; temporals 1–2 or 1–3, upper labials 8, lower 9.

In the South African specimens at hand there are two preoculars, and the scale rows are 27–31 at mid-body. Reference to the series described by Boulenger (1893, p. 333) proves that there is no geographic variation in the number of dorsal scale rows.

All four specimens are grayish brown above, with the two sharply defined white lines on each side of the head characteristic of this species. No trace of lateral lines. Venter uniform light gray.

The lateral light line figured by Andrew Smith (1849, 'Illustr. Zoöl. S. Africa, Reptiles,' Pl. xxii) is faintly visible in the adult specimen from Natal. It is significant that the variegation of the young shown in the same plate does not appear in the Lower Congo specimens, and a study of the variation in respect to juvenile and adult coloration might warrant the distinction of subspecies in this widely distributed form.

Boædon fuliginosus (Boie)

Plate V

Lycodon fuliginosus, Boie, 1827, 'Isis,' p. 551.

Boodon fuliginosus Boulenger, 1891, Ann. Mus. Stor. Nat. Genova, (2) XII, p. 15; 1893, 'Cat. Snakes,' I, p. 334. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 147. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 212. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 405; IV, p. 212. Klaptocz, 1913, Zool. Jahrb. (Syst.), XXXIV, p. 285. Werner, 1913, Mitt. Naturh. Mus. Hamburg, XXX, p. 21. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 646; 1920, p. 277.

Boaodon fuliginosus Chabanaud, 1917, Bull. Mus. Hist. Nat., Paris, XXIII, p. 10.

Boodon lineatus plutonis Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 334; 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1867.

Boædon fuliginosus is represented by fifteen specimens: A. M. N. H. Nos. 11988, 11989, 11990 (February, April and July 1911), 11991 (October 1912), Faradje; 12007 (April 1914), Medje; 11994 (July 1913), Nala; 11982–86 (November 1910), 11993, 12309 (June 1913), Niangara; 11995–96 (August 1913), Poko.

Boædon fuliginosus is a species characteristic of the Sudanese Subprovince. Its occurrence at Medje and Nala within the borders of the Rain Forest is anomalous, since usually species found both in the forest and savannah are more widely distributed. These localities, however, are not far from the forest border. In Cameroon it is also recorded from the forest, but it is evidently abundant only in the open country, as noted by Sternfeld (1908, p. 212).

Only two specimens are males. The larger measures 636 mm., tail length .17 of the total in both specimens. The largest female measures 972 mm. and the tail length in females varies only from .12–.13 of the total. Ventral plates in males 205–210, in females 220–235; subcaudals 59–64 and 48–52 respectively. A single preocular in all except two specimens, which have two. Two postoculars. Temporals 1–2. 1–3 in a single specimen. Upper labials 8, lower labials 9.

Uniform very dark gray above, light gray or white beneath.

The characters used by Boulenger (1893, p. 334) to distinguish *Boædon fuliginosus* from *B. lineatus* are the shorter parietals and the absence of the characteristic head markings. In the present series the proportionate length of the parietals varies from exactly the distance from the frontal to the end of the snout to once and a third that distance; only two specimens agreeing well with *B. fuliginosus* in this respect. The series, however, is very uniform in coloration and habitus, and appears to warrant distinction on these characters from *lineatus*. *Boodon lineatus plutonis* Werner, distinguished by the absence of the head markings, however, is undistinguishable from *B. fuliginosus* if the variability in length of parietals is taken into account, and it is this form which Werner records from the Lado at Mongalla (1907, p. 1867).

HOLUROPHOLIS Duméril

Holuropholis olivaceous Duméril

Plate IV, Figure 2

Holuropholis olivaceous A. Duméril, 1856, Rev. Mag. Zool., p. 466.

Boodon olivaceous Boulenger, 1891, Ann. Mus. Stor. Nat. Genova, (2) XII, p. 15; 1893, 'Cat. Snakes,' I, p. 335; 1896, III, p. 616. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 13. Sjöstedt, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 24. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 403; 1899, XLIX, p. 136. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 452. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 42. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 405; IV, p. 213. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 599. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 266. Müller, 1913, Zool. Anz., XLI, p. 234. Nieden, 1914, Sitzber. Ges. Naturf. Freunde Berlin, p. 366. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 202, 620; 1920, p. 277. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 468.

Boodon olivaceus (misprint) Boulenger, 1919, Rev. Zool. Africaine, VII, p. 21.

Twenty-seven specimens of *Holuropholis olivaceous* were collected: A. M. N. H. Nos. 11997–98 (September and October 1913), Akenge; 11981, 12017–18, 12019 (October and November 1909), Avakubi; 11978 (August 1909), Leopoldville; 12020 (September 1910), 12004–06, 12008 (April 1914), 12009–12 (June 1914), 12013 (July 1914), Medje; 11999-12001 (November 1913), 12002–03 (December 1913), Niapu; 11979–80, 12014–16 (August 1909), Stanleyville.

The distribution of this species is a consistent one, for it is confined to the forest in West Africa as well as in the Ituri. It was recorded from Gô, Upper Congo, by Müller (1913, p. 234).

The twenty-seven specimens exhibit only slight variation, but the range in scale count by Boulenger (1893, p. 335) is somewhat increased. The largest male measures 751 mm., the largest female 895 mm. The tail length in males is .15–.18 of the total, mean .17, .12–.13 in females. The ventrals in males range from 185–205, mean 193, the subcaudals from 49–57, mean 54. In females the range is 204–220, mean 209, and 41–46, mean 44. The dorsal scale count varies from 23–25–19 to 29–31–23, the higher counts occurring in females, the lower in males, with 27 the most frequent number at mid-body in both sexes. Three specimens have two preoculars, the others one. Two postoculars in all. Temporals 1–2 or 1–3, two in the first row in two specimens. Upper labials 8, lower 9.

The dorsum is uniform dark grayish brown, the dark color extending to the ends of the ventrals. Venter yellowish white, sometimes with black spots irregularly arranged, frequently invaded by the pigment from the sides, leaving only a narrow median line. Under surface of the tail dark in all specimens.

The stomachs of four specimens contained young or half-grown rats.

LYCOPHIDION Duméril and Bibron

Lycophidion laterale Hallowell

Plate IV, Figure 2

Lycophidion laterale HALLOWELL, 1857, Proc. Acad. Nat. Sci. Phila., p. 58.

Lycophidium laterale BOULENGER, 1893, 'Cat. Snakes,' I, p. 338; 1896, III, p. 616. MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 13. WERNER, 1897, Verh. Zool.-Bôt. Ges. Wien, XLVII, p. 209: 1899, XLIX, p. 136. BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 452. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 343. FERREIRA, 1903, Jorn. Sci. Lisboa, (2) VII, p. 10. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 406; IV, p. 213. WERNER, 1909, Mitt. Naturh. Mus. Hamburg, XXVI, p. 247. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., p. 599. BOULENGER, 1915, Proc. Zoöl. Soc. London, p. 202; 1920, p. 278.

Lycophidium laterale ocellata STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 406.

Six specimens of this species were collected as follows: A. M. N. H. No. 12029 (October 1913), Akenge; 12030–32 (June 1914), Medje; 12033–34 (tags corroded), Belgian Congo.

The distribution is essentially confined to the Rain Forest, extending beyond its borders in northern Angola and Togo.

Lycophidion laterale reaches a relatively large size for the genus, the largest female in the present series measuring 454 mm. The largest male measures 449 mm. The sexes are well distinguished. The tail length in males is .13–.14 of the total, .10 in females. Ventral plates 187–192 in males, 197–203 in females; subcaudals 43–45 in males, 34–35 in females. The dorsal scales are 17–17–17 in every case, differing in this respect from the other species of *Lycophidion* examined.

The coloration is highly characteristic. Dorsum light brown, with a dorsolateral row of dark brown, light-edged spots about the size of a scale on the sixth or seventh scale row. Sometimes a vertebral row of similar spots. Venter black, including the lower scale rows. Head dark brown with two broad light stripes on each side, uniting anteriorly.

Lycophidion irroratum (Leach)

Coluber irroratum Leach, 1819, in Bowdich, 'Miss. Ashantee,' App., p. 494.

Lycophidium irroratum Günther, 1868, Ann. Mag. Nat. Hist., (4) I, p. 426. Boulenger, 1893, 'Cat. Snakes,' I, p. 340; 1896, III, p. 617. Günther, 1896, Ann. Mag. Nat. Hist., (6) XVII, p. 264. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 398; 1902, LII, p. 338. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 212. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 406; IV, p. 213. Werner, 1910, Denkschr. Med. Naturw. Ges. Jena, XVI, p. 356. Boulenger, 1920, Proc. Zoöl. Soc. London, p. 278. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 468.

Two specimens have been referred to this species: A. M. N. H. No. 12041 (October 1910) Dungu; 12035 (June 1912), Garamba.

The distribution of this species is unsatisfactorily defined. Its absence from Angola and reappearance in Southwest Africa is anomalous. It is well known in the western Sudan, and its occurrence in the Uele District is consequently a normal extension of its range.

The two specimens are entirely blackish brown above and below, the smaller one somewhat lighter, without trace of spots. In scale characters they agree exactly with the description of Boulenger (1893, p. 340).

Measurements and Scale Characters

A. M. N. H. No.	12035	12041
Sex	♀	♀
Length	206	393 mm.
Tail	27	42 mm.
Tail/Length	0.13	0.11
Ventral Plates	175	183
Subcaudals	38	33
Dorsal Scales	17–17–15	17–17–15
Preoculars	1	1
Postoculars	2	2
Temporals	1–2	1–2
Upper Labials	8	8
Lower Labials	8	8

Lycophidion fasciatum (Günther)

Alopecion fasciatum Günther, 1858, 'Cat. Col. Snakes,' p. 196.

Lycophidium fasciatum Boulenger, 1893, 'Cat. Snakes,' I, p. 342. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 209; 1899, XLIX, p. 136. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 452. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 344. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 212. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 406; IV, p. 213. Werner, 1909, Mitt. Naturh. Mus. Hamburg, XXVI, p. 217. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 599. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 202; 1919, Rev. Zool. Africaine, VII, p. 21; 1920. Proc. Zoöl. Soc. London, p. 278. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 468.

Six specimens in the collection: A. M. N. H. Nos. 12024–25 (April 1914), 12026–28 (June 1914), Medje; 12023 (January 1914), Niapu.

Boulenger (1915, p. 202) has recorded this species as occurring in the Ituri Forest, and it ranges west to Sierra Leone, evidently distributed throughout the entire Rain Forest.

The largest male measures 325 mm., the largest female 339 mm. The tail length is not different in the sexes, ranging from .12–.15 of the total. Ventral plates 175–184; subcaudals 41–47; dorsal scale rows 17–17–15. One preocular, two postoculars; temporals 1–2; upper labials 7, the third, fourth and fifth entering the eye. Lower labials 8, the first five in contact with the anterior chin-shields.

The narrow dark crossbands, frequently interrupted on the dorsal line, are very distinct in juvenile specimens, almost invisible in the largest. There are thirty-one crossbars (on one side) on the body, ten on the tail. The venter is uniformly dark gray, the head entirely without markings.

Lycophidion elapoides Günther

Lycophidium elapoides Günther, 1874, Proc. Zoöl. Soc. London, p. 444. Boulenger, 1893, 'Cat. Snakes,' I, p. 343, Pl. xxii, fig. 3; 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 212. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 406. Boulenger, 1920, Proc. Zoöl. Soc. London, p. 279.

A single specimen, A. M. N. H. No. 12022 (May 1914), was collected at Medje.

Lycophidion elapoides is a rare snake, hitherto known only from the Cameroon forest. Its occurrence at Medje proves that it is a widely distributed forest species.

The specimen agrees with Boulenger's description and figure with the exception of having interspaces between the dark crossbands much wider than the bands. Boulenger states that the temporals are 2–3, but the figures show temporals 1–2. The number of ventral plates, 244, is much higher than the 225 of the type, but specimens recorded by Sternfeld (1908, p. 406) are intermediate between these two extremes. The loreal of one side enters the eye, on the other side it is excluded.

The color above is a light reddish brown, with twenty-one black crossbands, not extending on the venter, three or four scales in length. Four of these are interrupted on the vertebral line, others are diagonal. Nine black bands on the tail. Top of the head black, joining the first crossband, and outlined on the sides with lighter punctate lines as in *Lycophidion laterale*. Venter pink, uniformly and profusely spotted with black.

Measurements and Scale Characters

A. M. N. H. No.	12022
Sex	♂
Length	490 mm.
Tail	95 mm.
Tail/Length	0.19
Ventral Plates	244
Subcaudals	78
Dorsal Scales	17–17–15
Preoculars	1
Postoculars	2
Temporals	1–2
Upper Labials	8
Lower Labials	8

HORMONOTUS Hallowell

Hormonotus modestus (Duméril and Bibron)

Lamprophis modestus Duméril and Bibron, 1854, 'Erpétol. Gén.,' VII, p. 429.

Hormonotus modestus Günther, 1862, Ann. Mag. Nat. Hist., (3) IX, p. 53. Boulenger, 1893, 'Cat. Snakes,' I, p. 343; 1896, III, p. 617. Bocage, 1895, Jorn. Sci. Lisboa, (2) IV, p. 13. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 13. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 209; 1899, XLIX, p. 137. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 452. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 43. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 406; IV, p. 213. Boulenger, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 303. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 599. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 164. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 204. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 369; 1917, XXIII, p. 10. Boulenger, 1920, Proc. Zoöl. Soc. London, p. 279.

Five specimens of *Hormonotus* were collected: A. M. N. H. No. 12037 (May 1910), 12039, 12040 (April and June 1914), Medje; 12038 (December 1913), Niapu; 12036 (August 1909), Stanleyville.

Hormonotus has a characteristic forest distribution, reaching the forest islands in Uganda and Togo.

The largest of the three males measures 743 mm., the larger female 687 mm. The tail length in males measures .21–.23 of the total, in females .19–.20. Ventral plates 220–228; subcaudals 96–103 in males, 77–86 in females. Dorsal scales 15–15–13. One preocular; three postoculars; temporals 2–3; 2–2 on one side in one specimen. Upper labials 8, the third, fourth and fifth entering the eye; lower labials 9, four in contact with the anterior chin shields.

The coloration is uniform grayish brown, lighter beneath. The head shields are narrowly but sharply margined with white, producing a very characteristic reticulate appearance; each of the lower labials has a dark spot.

MEHELYA Csiki

Mehelya lamani Lönnberg

Mehelya lamani Lönnberg, 1911, Ark. Zool., Stockholm, No. 8, p. 1, fig. 1.
Simocephalus lamani Boulenger, 1915, Proc. Zoöl. Soc. London, p. 203.

Four specimens of this species, which has previously been known from a single specimen from the Lower Congo, were collected: A. M. N. H. No. 12054 (June 1914), Medje; 12043 (December 1910), Niangara; 12042, 12044 (tags corroded), Belgian Congo.

The genus *Mehelya* ranges over the whole of Africa south of the Sahara, with the exception of Southwest Africa. The distribution of the individual species cannot be satisfactorily determined until the genus is revised, no less than eight of the sixteen species being known from only a single record. It seems very likely that the number of species can be materially reduced by comparative study. The reference of *M. phyllopholis* of Cameroon to *M. chanleri* of Kenya Colony (Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 407) does not, however, seem geographically probable. Sternfeld (1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 268) records *M. baumanni* from Avakubi, which adds a third species for the Ituri. *Simocephalus* (*Cephalosimus*) *insignus* Chabanaud (1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 369, Figs. 10–11) seems to be referable to *Gonionotophis brussauxi* Mocquard, with which it agrees in essential characters.

The four specimens under consideration differ from Lönnberg's description in having a slightly larger frontal, and the vertebral scale row does not extend to the parietals; nor does Lönnberg describe the extremely compressed dorsum, the body having a distinctly triangular cross-section.

The larger of the two males (tail slightly damaged) measures 1290 mm., the type measuring 1450 mm. The larger female measures 1120 mm. The tail length is .13 of the total in all of the specimens, .12 in the type. The ventrals range from 227–236, the subcaudals from 53–60. Dorsal scales 17–15–15. One preocular and two postoculars, three postoculars on one side in one specimen. Temporals 1–2 or 1–3. Upper labials 7, the third and fourth entering the eye. Lower labials 8 or 9, five in contact with the anterior chin shields. The scales are rather widely separated in all specimens, with the exception of the three vertebral and the lateral rows. The development of lateral keels, the diagonal striation on the dorsal scales and the rugose head shields distinguish this species at once from *M. poensis* and *M. baumanni.*

The color is a uniform brown, the skin between the scales somewhat lighter.

Mehelya poensis (Smith)

Plate VI

Heterolepis poensis SMITH, 1849, 'Ill. Zoöl. S. Africa, Rept.,' (under *H. capensis*, Pl. LV).

Simocephalus poensis BOULENGER, 1899, 'Cat. Snakes,' I, p. 346. MATSCHIE, 1893, Mitt. Deutsch. Schutzgeb., VI, p. 211. SJÖSTEDT, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 24. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 69. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 137; 1902, LII, p. 344. BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 43. BOULENGER, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 212. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 406; IV, p. 213. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 600. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 164; 1915, Proc. Zoöl. Soc. London, pp. 203, 621. CHABANAUD, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 369. BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 22; 1920, Proc. Zoöl. Soc. London, p. 280. CHABANAUD, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 468.

Mehelya poensis LÖNNBERG, 1911, Ark. Zool., Stockholm, VII, No. 8, p. 3. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199.

Eleven specimens have been referred to this species: A. M. N. H. No. 12056 (December 1913), Avakubi; 12048 (February 1910), Gamangui; 12049–50 (September 1910), 12052–53, 12055 (June 1914), Medje; 12051 (July 1913), Nala; 12045–47 (August 1909), Stanleyville.

The distribution of *Mehelya poensis* is that of a forest species reaching East Africa.

The species is readily distinguished from the preceding by the unicarinate scales, otherwise smooth, the longer tail, and the extremely depressed, broad and elongate snout. The snout appears to be slightly longer in females than in males.

The largest male measures 844 mm., the largest female 1145 mm. The tail length in six females is .20–.21 of the total, in four males .24 of the total. The ventral plates range from 245–254 in females, and from 242–246 in males; subcaudals 105–111 in males, 93–103 in females. Dorsal scales 17–15–15, 19 on the neck in one specimen. A single preocular, two postoculars, three on one side in two specimens, temporals invariably 1–2. Seven upper labials, third and fourth entering the eye; eight lower labials, first five in contact with the anterior chin shields.

Color uniform grayish brown above, the exposed skin between the scales lighter.

One specimen, from Stanleyville, was taken in the grass; one from Gamangui in the plantations.

CHLOROPHIS Hallowell

SYNOPSIS OF THE SPECIES

A.—Anal entire, ventrals keeled.

B.—Dorsal scales in 13 rows (Rain Forest) .... *carinatus.*

BB.—Dorsal scales in 15 rows.

C.—One anterior temporal; VP. 164–170, SC. 123 (Eastern Sudan) *bequaerti.*

CC.—Two anterior temporals; VP. 148–162, SC. 78–92 (Rain Forest) *heterodermus.*

AA.—Anal divided.

B.—Ventrals without trace of keel.

C.—Scales in 13 rows; VP. 148, SC. 75 (Tanganyika Territory; Ituri) .... *macrops.*

CC.—Scales in 15 rows.

D.—Two upper labials entering the eye; VP. 150–169, SC. 82–105 (Southeast and East Africa) .... *hoplogaster.*

DD.—Three upper labials entering the eye.

E.—Seven upper labials; VP. 182, SC. 114 (Lake Region) .... *schubotzi.*

EE.—Eight upper labials; VP. 152–166, SC. 85–99 (Angola; Portuguese Guinea?) ...... *ornatus.*

EEE.—Nine upper labials; VP. 155–190, SC. 103–123 (Lake Region, Eastern Sudan) .... *emini.*

BB.—Ventrals with a lateral keel.

C.—Two upper labials entering the eye.

D.—Two anterior temporals; VP. 151–169, SC. 114–124 (Southeast Africa; Togo ?) .... *natalensis.*

DD.—One anterior temporal.

E.—Loreal nearly as deep as long; VP. 150–160, SC. 90–100 (Angola) .... *angolensis.*

EE.—Loreal twice as long as deep; VP. 149–166, SC. 77–144 (East and Northeast Africa; Rhodesia; Cameroon ?) .... *neglectus*

CC.—Three upper labials entering the eye.
D.—Seven upper labials; VP. 185, SC. 129; body very slender (Cameroon; Hinterland) . . . . *gracilis.*
DD.—Eight or nine upper labials; VP. 175–190, SC. 115–190; body very slender (Borders of Rain Forest), *heterolepidotus.*
DDD.—Nine upper labials; temporals 1 (2) – 2 (1); VP. 150–182, SC. 90–133; body somewhat stouter (Savannah Province, except Southwest Africa; occasional in the Forest), *irregularis.*

Chlorophis carinatus Andersson

Chlorophis carinatus ANDERSSON, 1901, Bihang Svenska Vetensk.-Akad. Handl., XXVII, part 4, No. 5, p. 9. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 407. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 601. BOULENGER, 1915, Proc. Zoöl. Soc. London, p. 205; 1919, Rev. Zool. Africaine VII, p. 23; 1920, Proc. Zoöl. Soc. London, p. 282.

Twenty-one specimens of *Chlorophis carinatus* were collected: A. M. N. H. No. 12076 (November 1909), Avakubi; 12077 (July 1913), Babonde, south of Medje; 12075 (September 1909), Batama; 12057 (April 1910), 12058 (May 1910), 12064–66, 12067–72 (April and June 1914), Medje; 12060 (July 1913), Nala; 12061–62, 12063 (November and December 1913), Niapu; 12074 (August 1909), 12078–79 (April 1915), Stanleyville.

Chlorophis carinatus appears to be much more abundant in the Ituri Forest than in the Cameroon-Gaboon area. It is closely confined to the Rain Forest, and is apparently the only species of the genus that can be regarded as essentially a forest form.

The largest male measures 705 mm., the largest female 695 mm. The tail length varies from .25–.28, mean .27 in males, and from .22–.25, mean .24 in females. Ventral plates 148–158 in males, mean 152, 159–165 in females, mean 161. Subcaudals 80–91, mean 87, in males, 74–86, mean 79, in females. Dorsal scales invariably 13–13–11. One pre- and two postoculars in all. Temporals 2–2 or 2–2–2, rarely 2–3; in one specimen 3–2–2. Upper labials 9, lower labials 10 or 11.

Dark bluish green above and below, chin whitish, in formalin specimens. Juvenile alcoholic specimens are bronzy green, more or less distinctly crossbarred.

A specimen fell from the thatch onto the table in the collector's room at Avakubi.

Chlorophis bequaerti, new species

Two specimens from Niangara, A. M. N. H. Nos. 12073, 12080 (November 1910), represent a new form, confined, probably, to the eastern Sudan, where apparently it replaces *Chlorophis heterodermus*, which ranges from Portuguese Guinea to Cameroon.

DIAGNOSTIC CHARACTERS

Habitus very slender, tail one-third the total length; ventral plates distinctly keeled; anal entire; three labials entering the eye; one anterior temporal; dorsal scales in fifteen rows; ventrals 164–170, subcaudals, 123.

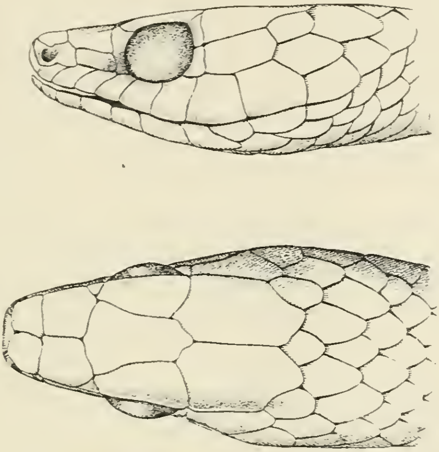


Fig. 3. Dorsal and lateral views of head of *Chlorophis bequaerti*, new species, (12073, paratype, × 2).

DETAILED DESCRIPTION

Type.—A. M. N. H. No. 12080, ♂.

Habitus slender, slight compressed, tail length .33 of the total, eye large, canthus rostralis distinct.

Rostral slightly wider than high, visible from above. Internasals considerably smaller than the prefrontals. Frontal bell-shaped, longer than its distance from the end of the snout, shorter than the parietals. Nasal divided, in contact with the first and second labials. Loreal rectangular, twice as long as high. A single preocular barely in contact with the frontal; two postoculars. Temporals, 1–1. Nine upper labials, fourth, fifth and sixth entering the eye. Eleven lower labials, first five in contact with the anterior chin shields. Posterior chin shields longer, with a long median suture.

Dorsal scales, 15–15–11, very oblique anteriorly. Ventral plates 164, with a distinct keel. Subcaudals, 123. Total length 652 mm., tail 212 mm. (.33).

Color dark bluish gray above and below. Posterior chin shields and gulars light.

Comparison of Paratypes

The single paratype, a female, has a slightly incomplete tail. Ventral plates 170, subcaudals 98. Temporals 1–2. Somewhat stouter habitus, probably a sex character.

Chlorophis bequaerti is distinguished from *C. carinatus* by the fifteen dorsal scales and the single anterior temporal. From *C. heterodermus*, its closest ally, it is distinguishable by the single anterior temporal, the longer tail and higher number of subcaudals, and by a higher number of ventral plates.

Chlorophis heterolepidotus (Günther)

Ahaetulla heterolepidota Günther, 1863, Ann. Mag. Nat. Hist., (3) XI, p. 286.

Chlorophis heterolepidotus Boulenger, 1894, 'Cat. Snakes,' II, p. 95, Pl. v, fig. 3; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 278. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 69. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 344. Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 112. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, IV, p. 214; 1912, 'Wiss Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 270. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 205, 623; 1920, p. 281.

Three specimens of this distinct species: A. M. N. H. No. 12086, 10287, 12092 (April, May and June 1913), Niangara.

This species, far less common than *C. irregularis*, also ranges entirely around the forest border, being known from Eastern Gold Coast, the Sudan, East Africa and the Lake Region, and the Lower Congo and Angola.

The three specimens conform closely to the descriptions. The color is dark green above and beneath, chin lighter.

Measurements and Scale Characters

A. M. N. H. No.	12086	12087	12092
Sex	♀	♂	♀
Length	764	730	742
Tail	264	250	234
Tail/Length	0.32	0.34	0.31
Ventral Plates	186	193	189
Subcaudals	117	134	117
Dorsal Scales	15–15–11	15–15–11	15–15–11
Preoculars	1	1	1
Postoculars	2	2	2
Temporals	1–1	1–1	1–1
Upper Labials	8–9	8	9
Lower Labials	10	10	10

Chlorophis irregularis (Leach)

Coluber irregularis Leach, 1819, in Bowdich, 'Miss. Ashantee,' p. 494.

Chlorophis irregularis Boulenger, 1891, Proc. Zoöl. Soc. London, p. 306; 1894, 'Cat. Snakes,' II, p. 96; 1896, III, p. 631. Mocquard, 1896, Bull. Mus. Hist.

Nat., Paris, II, p. 59. PERACCA, 1896, Boll. Mus. Torino, XI, No. 255, p. 2. BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 278; Proc. Zoöl. Soc. London, p. 801. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 70, fig. D. WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 398; 1899, XLIX, p. 147. BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 446. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 334, 344. FERREIRA, 1903, Jorn. Sci. Lisboa, (2) VII, p. 10. BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 112; Ann. Mus. Stor. Nat. Genova, (3) II, p. 213. ROUX, 1907, Zool. Jahrb. (Syst.), XXV, p. 734. WERNER, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1871, Pl. III, fig. 5. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 407; IV, pp. 214, 243. CHUBB, 1909, Proc. Zoöl. Soc. London, p. 595. GENDRE, 1909, Extr. C. R. Soc. Linn. Bordeaux, p. cvi. BOULENGER, 1910, Ann. S. African Mus., V, p. 508. STERNFELD, 1910, Mitt. Zool. Mus. Berlin, V, p. 64. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 165. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' p. 270. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 205, 623. CHABANAUD, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 371; 1917, XXIII, p. 11; 1919, XXV, p. 567. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 282. CHABANAUD, 1921, Bull. Com Études Hist. Scient. Afrique Occ. Française, p. 468.

Fifteen specimens of *Chlorophis irregularis:* A. M. N. H. Nos. 12059, 12085 (July 1911), Aba; 12083–84 (March 1911), Faradje; 12081–82 (November 1910), 12090–91 (June 1913), Niangara; 12094–97 (August 1909), Stanleyville; 12098–12100 (November 1911), Yakuluku.

It proves impossible to distinguish the four specimens from Stanleyville from those taken in the savannah, and for the present it must be assumed that this wide-ranging savannah species enters the forest in Cameroon as well as in the Ituri. Records from the forest, however, are rare, while it is a very common species in the savannah. It has the distribution typical of a number of savannah species, reaching Natal to the south, but absent from Southwest Africa, although it reaches Angola.

The largest male measures 843 mm., the largest female 1005 mm. The tail length in males varies from .30–.33 of the total, mean .31; and from. 27–.30 in females, mean .29. The sexes are not distinguishable by the number of ventral plates, which range from 152–173, mean 161. The subcaudals in males range from 96–113, mean 107, from 93–109, mean 103, in females. Dorsal scale rows usually 15–15–11, rarely 13 or 17 on the neck. One pre- and two postoculars. Temporals 1–1 in eleven specimens, 1–2 in two, and 1–1 + 1–2 in two others, slightly differing in this respect from the normal *C. irregularis,* in which the temporals are most frequently 1–2. Two to five slightly enlarged occipitals. Upper labials 8, rarely 7 or 8; lower labials 10 or 11.

Bright green above, very pale green on the venter, many of the dorsal scales with a white basal spot. The black skin between the scales is very conspicuous in some specimens, and it appears especially when the specimen is injected.

One specimen from Stanleyville was caught at the base of a tree, beneath a heap of leaves, another, from Niangara, was taken from a pawpaw tree.

One specimen contained a frog; another a lizard.

PHILOTHAMNUS Smith

Philothamnus nitidus (Günther)

Ahætulla nitida GÜNTHER, 1863, Ann. Mag. Nat. Hist., (3) XI, p. 286.

Philothamnus nitidus BOULENGER, 1894, 'Cat. Snakes,' II, p. 100. GÜNTHER, 1896, Ann. Mag. Nat. Hist., (6) XVII, p. 264. WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 403; 1899, XLIX, pp. 137, 147. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 408; IV, p. 215. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 601. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 282.

Philothamnus semivariegatus BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 23.

Fifteen specimens of *Philothamnus nitidus* were secured: A. M. N. H. No. 12113 (September 1913), Akenge; 12101–2 (October 1909), Avakubi; 12110, 12112 (January 1910), Gamangui; 12088–89 (May and August 1910), 12107–9 (April 1914), Medje; 12103 (November 1910), Niangara; 12104–6 (December 1913), Niapu; 12093 (tag corroded), Belgian Congo.

This species evidently replaces *Philothamnus semivariegatus* in the Rain Forest. Boulenger (1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 213) records the latter species from Victoria, Cameroon, but the specimen should probably be referred to *P. nitidus*, as Sternfeld (1908, p. 408) has since referred other supposed *P. semivariegatus* from Cameroon.

The largest of the four males measures 895 mm., the largest female 930 mm. The tail length in males varies from .36–.39 of the total length; in females from .35–.36. Ventral plates range from 164–175; the subcaudals from 134–153 in males, and from 129–140 in females. The dorsal scales are uniformly 15–15–11; one pre- and two postoculars. Temporals variable, usually 1–2, or 1–1–2, sometimes 1–2–2, in one case 1–1–1. Nine upper and nine to eleven lower labials.

The coloration is bluish green above, the scales outlined with black, lighter green beneath, the throat nearly white.

Philothamnus dorsalis (Bocage)

Leptophis dorsalis BOCAGE, 1866, Jorn. Sci. Lisboa, (1) I, p. 69.

Philothamnus dorsalis PETERS, 1876, Monatsber. Akad. Wiss. Berlin, p. 119. BOULENGER, 1895, 'Cat. Snakes,' II, p. 101; 1896, III, p. 631. BOCAGE, 1897, Jorn. Sci. Lisboa, (2) IV, p. 200. BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 278. MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 12. FERreira, 1898, Jorn. Sci. Lisboa, (2) IV, p. 244. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 452; 1915, p. 206; 1920, p. 282.

A single specimen of this species, A. M. N. H. No. 12111, was taken at Banana, Lower Congo, August 1915.

Philothamnus dorsalis is a distinctly Angolan species, reaching the border of the forest north of the mouth of the Congo. The record from Tanganyika Territory (Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 71) has not been confirmed, but it is entirely probable that *dorsalis* reaches at least the western shore of Lake Tanganyika, with a forest-border distinction similar to that of many Sudanese species. It is possible that the East African record of *P. thomensis* (Tornier, *loc. cit.*) should be referred to this species.

The specimen is a female, 741 mm. in length, of which the tail occupies 254 mm., or .34 of the total length. Ventral plates 178, subcaudals 121. Dorsal scale rows 15–15–11. One pre- and two postoculars; temporals 1–1–1; three slightly enlarged occipitals. Upper labials 9, lower labials 11.

General color a bronzy green, most of the scales on the anterior half of the body with a small white spot at the anterolateral corner. Brownish crossbands on the anterior portion of the back, about as wide as the interspaces, merging into a longitudinal line on the three median scale rows posteriorly. Venter greenish gray, with a sharp black line following the keels. Throat, chin, and labials yellow, snout reddish brown.

GASTROPYXIS Cope

Gastropyxis smaragdina (Schlegel)

Plate VII

Dendrophis smaragdina Schlegel, 1837, 'Phys. Serp.,' II, p. 237.

Gastropyxis smaragdina Cope, 1860, Proc. Acad. Nat. Sci. Phila., p. 558. Boulenger, 1894, 'Cat. Snakes,' II, p. 103; 1896, III, p. 631; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 278. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 12. Sjöstedt, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 24. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 403; 1899, XLIX, p. 137. Boulenger, 1900, Proc. Zool. Soc. London, p. 452. Tornier, 1901, Zool. Anz., XXIV. p. 64. Lampe, 1902, Jahrb. Nasasu. Ver. Naturk., LV, p. 57. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 338, 344. Ferreira, 1903, Jorn. Sci. Lisboa, (2) VII, p. 10. Gough, 1903, Zool. Jahrb. (Syst.), XVII, p. 465. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 213. Johnston, 1906, 'Liberia,' II, p. 832. Boulenger, 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 5. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 408; IV, p. 215. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 601. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 165. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. Müller, 1913, Zool. Anz., XLI, p. 64. Boulenger, 1915, Proc. Zool. Soc.

London, pp. 206, 623. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 372. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 23: 1920, Proc. Zoöl. Soc. London, p. 283. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 468.

Fifteen specimens of this species were collected: A. M. N. H. No. 12120 (December 1913), Avakubi; 12115, 12116–17, 12118 (May, August and September 1910), 12121–27, 12128 (April and June 1914), Medje; 12119 (June 1913), Niangara; 12114 (August 1909), Stanleyville.

Gastropyxis smaragdina is a wide-ranging forest species, reaching Eastern Gold Coast and northern Angola, and recorded in East Africa from the Sesse Islands in Lake Victoria.

The largest male measures 865 mm., the largest female 1112 mm. The sexes are not distinguished either by tail length or number of ventrals and subcaudals. The tail length varies from .37–.39 of the total. Ventral plates 152–161, subcaudals 141–146. Dorsal scale count uniformly 15–15–11. Invariably one pre- and two postoculars. Temporals 1–2 or 1–1–2. Upper labials 9, lower 9 or 10.

The color is green above, lighter yellowish green beneath, with a black line through the eye. Venter uniform green with a dark line on each side corresponding to the keels.

A female taken in April 1914 (No. 12121) contained three eggs which are remarkably elongate, measuring 56 × 12 mm.

HAPSIDOPHRYS Fischer

Hapsidophrys lineatus Fischer

Hapsidophrys lineatus Fischer, 1856, Abh. Naturw. Ver. Hamburg, III, p. 111, Pl. II, fig. 5. Boulenger, 1894, 'Cat. Snakes,' II, p. 104. Bocage, 1895, 'Herpétol. Angola,' p. 97; Jorn. Sci. Lisboa, (2) IV, p. 13. Günther, 1896, Ann. Mag. Nat. Hist., (6) XVII, p. 264. Mocquard, 1896, Bull. Mus. Hist. Nat., Paris, II, p. 59. Boulenger, 1897, Ann.Mag. Nat. Hist., (6) XIX, p. 278. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 12. Sjöstedt, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 24. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 137. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 453. Tornier, 1901, Zool. Anz., XXIV, p. 64. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 43. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 213. Johnston, 1906, 'Liberia,' II, p. 832. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 408; IV, p. 215. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 602. Boulenger, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 303; 1911, (3) IV, p. 165; 1915, Proc. Zoöl. Soc. London, pp. 206, 624; 1919, Rev. Zool. Africaine, VII, p. 23; 1920, Proc. Zoöl. Soc. London, p. 283. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 469.

Eight specimens of *Hapsidophrys lineatus* were collected, frequently in the same lot with *Gastropyxis:* A. M. N. H. Nos. 12131, 12132–33

(August and September 1910), 12134–36, 12129 (April and June 1914), Medje; 12130 (August 1909), Stanleyville.

Hapsidophrys has practically the same distribution as *Gastropyxis*, reaching French Guinea to the west and Uganda to the east, but rather closely confined to the Rain Forest.

The largest male measures 1102 mm., the largest female 1070 mm. The tail length, which does not differ in the sexes, occupies .28–.30 of the total. The ventrals range from 158–166, the subcaudals from 101–110. Dorsal scales uniformly 15–15–11. Invariably one pre- and two postoculars. Temporals 2–2 in all specimens. Upper labials 8 or 9, lower 9 or 10. One specimen lacks the loreal on one side, by fusion with the prefrontal.

Coloration normal. General color above bluish green, all of the scales with dark lateral edges, producing a lineate effect. Venter light green with only a very faint darker line on the keels.

RHAMNOPHIS Günther

SYNOPSIS OF THE SPECIES OF *Rhamnophis* AND *Thrasops*

A.—Dorsal scales smooth; vertebral row distinctly enlarged; rostral low, subtriangular; large occipitals present . . . . *Rhamnophis*.
  B.—Anal divided, scales in 15–19 rows.
    C.—Dorsal scales in 17 rows (rarely 19); two postoculars; eight upper labials; ventrals 158–179 . . . . *æthiopissa*.
    CC.—Dorsal scales in 15 rows (rarely 17); two postoculars; eight upper labials; ventrals 159–172 . . . . *ituriensis*.
  BB.—Anal entire, scales in 13 rows; three postoculars; seven upper labials; ventrals 163–177 . . . . *batesii*.
AA.—Dorsal scales keeled or smooth; vertebral row scarcely if at all enlarged; rostral high, square, with vertical sides; postparietals numerous, sometimes a little enlarged . . . . *Thrasops*.
  B.—Dorsal scales in 19 rows; ventrals 192–211; throat in adult faintly gray . . . . *jacksoni*.
  BB.—Dorsal scales in 17 rows; ventrals 173–187; (throat gray?) . *rothschildi*.
  BBB.—Dorsal scales in 13–15 rows; ventrals 179–206; throat bright yellow in adult . . . . *flavigularis*.

Rhamnophis ituriensis, new species

Rhamnophis æthiops BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 23.

Ten specimens of *Rhamnophis* are distinguished from *R. æthiopissa* Günther: A. M. N. H. Nos. 12507–08 (February 1910), Gamangui; 12490–91 (May 1910), Medje; 12492 (November 1910), Niangara; 12500–02 (November 1913), 12505–06 (January 1914), Niapu.

The new form replaces the West African *Rhamnophis æthiopissa* in the Ituri.

DIAGNOSTIC CHARACTERS

Habitus slender, tail more than a third the total length, eye large, its diameter equaling the length of the snout. A pair of very large occipital shields; dorsal scales smooth, very oblique, in fifteen rows, the vertebral row enlarged. Ventral plates 159–172, subcaudals 134–150.

DETAILED DESCRIPTION

Type.—A. M. N. H. No. 12505, ♀.

Habitus of arboreal species, tail .34 of the total length. Eye very large, the diameter equaling the length of the snout, pupil round. Snout flattened, obtusely truncate, canthus rostralis rounded.

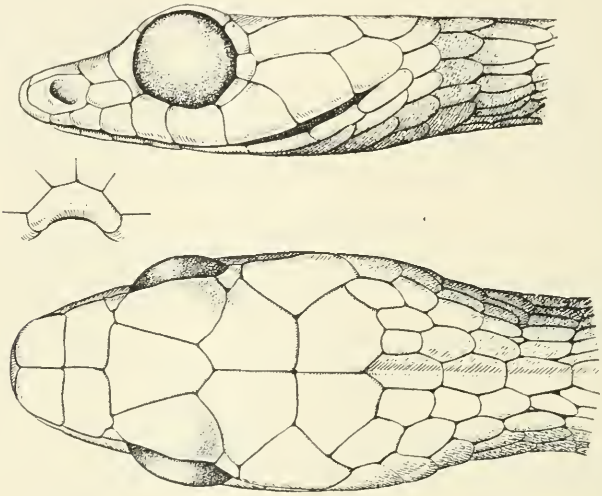


Fig. 4. Dorsal and lateral views of head and front view of rostral of *Rhamnophis ituriensis*, new species, (12505, type, × 2).

Rostral much wider than high, narrowly visible from above. Internasal suture slightly longer than the prefrontal; prefrontals extending on the sides of the snout to the loreal; nasal divided; loreal once and a half as long as high; frontal as long as its distance from the end of the snout, slightly shorter than the parietals, five-sided, the lateral sides straight, converging behind; parietals nearly as wide as long; two very large occipitals, one in contact with the eighth labial, the other narrowly separated from it; one preocular, not reaching the frontal; two postoculars; a single large temporal; eight upper labials, the fourth and fifth entering the eye; nine lower labials, the first five in contact with the anterior chin shields; three pairs of chin shields, the second largest.

Dorsal scales smooth with apical pits, in 15–15–11 rows, very oblique; the vertebral row strongly enlarged, its scales at least twice as wide as the adjacent laterals. Ventrals 166, obtusely angulate, without keel; anal divided; subcaudals divided, 140.

General color above bluish black, the center of each scale with a lighter bluish line, these making four continuous light lines on the tail. Ventrals bluish olive, with a well-defined, nearly continuous light line on the lateral angle, and with a black spot either adjacent to this line or at the lateral end of the ventral; subcaudals more or less spotted with black, a well-defined median black line posteriorly; chin shields and throat yellowish; labials and head uniform dark bluish gray.

Length 1305 mm., tail 440 mm.

COMPARISON OF PARATYPES

In the series of paratypes, three males and six females, the largest female measures 1290 mm., tail 458 mm. (the type being the largest male). The tail length varies from .34–.38 of the total, with no difference for sex. Ventral plates 164–166 in males, 159–172, mean 170, in females; dorsal scales 15–15–11 in all but two specimens, one of which has 19–15–11, the other 15–17–11.

Two specimens have two preoculars on each side; one has postoculars 2–3, one postoculars 4–4. A single large temporal in every specimen; one specimen has three large occipitals, one being longitudinally divided; two specimens have only seven upper labials, and the lower labials, usually 9, vary from 8–10.

The two specimens from Medje reported by Boulenger agree with the present series in having fifteen scale rows instead of seventeen, as in the *R. æthiopissa* of West Africa. The relationship with the latter species is so close that the two forms will probably be found to represent subspecies.

One of the smaller specimens shows the more vivid juvenile coloration. The light portion of each scale is much larger, the black reduced to a narrow rim, with the alternate black and light lines on the tail sharply defined.

The validity of the genus *Rhamnophis* has been questioned by various authors, beginning with Boulenger (1896, 'Cat. Snakes,' III, p. 632). Part of this uncertainty is due to the emphasis of the wrong characters, which caused Boulenger to place *Thrasops jacksoni* in *Rhamnophis.* Although the writer has been able to examine only four of the six species of the two genera, it seems certain that the correlation of several minor characters, common to a group of species, such as has been indicated in the foregoing synopsis, is basis for generic distinction; but *Rhamnophis* is further distinguished from *Thrasops* by a character of the hemipenis. In *Rhamnophis ituriensis* the hemipenis has four large spines about the base, with the remainder calyculate; in *Thrasops jacksoni* it is heavily spinose on one side for its entire length.

Rhamnophis batesii (Boulenger)

Thrasops batesii BOULENGER, 1908, Ann. Mag. Nat. Hist., (8) II, p. 93; 1920, Proc. Zoöl. Soc. London, p. 283.

Three specimens of this rare and distinct species: A. M. N. H. No. 12137 (February 1910), Gamangui; 12503–04 (November 1913), Niapu.

Rhamnophis batesii must be continuously distributed throughout at least the eastern division of the Rain Forest from Cameroon to the Ituri. It is known from both the Kribi and Ja river basins in Cameroon.

The largest specimen, a female, tail mutilated, measures 1060 mm., 770 mm. to the vent, the largest specimen of the type series measuring 1800 mm. In the original description, the enlarged vertebral scales are not mentioned, but the agreement in every other respect is so close that there can be no question of the identity of the present specimens with the Cameroon species. The two pairs of occipitals and the large seventh labial, bordering the temporal for its entire length, distinguish *Rhamnophis batesii* from *R. æthiopissa* and *R. ituriensis*. *R. batesii* is also distinguished from the other two species of *Rhamnophis* by the single anal and the larger number of maxillary teeth, but the relationship is nevertheless close, and the affinities would be disguised by the use of a generic or subgeneric name.

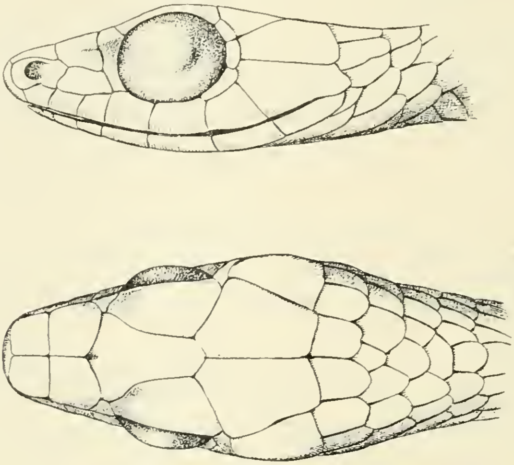


Fig. 5. Dorsal and lateral views of head of *Rhamnophis batesii* (Boulenger), (12173, × 2).

The coloration is very distinctive, but still similar in plan to that of *R. ituriensis*, the light color predominating instead of the black. Scales (in alcohol) light gray, with a violet tinge, narrowly edged with black; all of the head shields distinctly violet. Upper and lower labials, temporals and occipitals outlined with black; venter light gray with violet tinge, and scattered black spots, which are more numerous posteriorly, but most sharply defined anteriorly; light line on the lateral angle of the ventrals very faint. Tail with the scales very narrowly edged with black, very different from the heavy black lines of *R. ituriensis*.

In the full-grown specimen (1060 mm.) the coloration is the same as in the young, with no evidence of the darkening of all the scales from the edges as in *R. ituriensis*. The violet ground color is darker throughout in this specimen. The violet venter is strikingly different from the dark bluish olive of *R. ituriensis*.

Measurements and Scale Characters

A. M. N. H. No.	12137	12503	12504
Sex	♀	♂	♂
Length	1060	640	825 mm.
Tail	......	183	210 mm.
Tail/ Length	....	0.29	0.25
Ventral Plates	177	172	176
Subcaudals	....	108	91
Dorsal Scales	13–13–11	13–13–11	13–13–11
Preoculars	1	1	1
Postoculars	3	3	3
Occipitals	4	4	4
Upper Labials	7	7	7
Lower Labials	8	8	8–9

THRASOPS Hallowell

Thrasops jacksoni Günther

Thrasops jacksoni GÜNTHER, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 528. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, IV, p. 215, figs. 2–3; 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199.

Rhamnophis jacksoni BOULENGER, 1896, 'Cat. Snakes,' III, p. 632; 1902, in Johnston, 'Uganda Protectorate,' p. 446; 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 165; 1915, Proc. Zoöl. Soc. London, p. 624; 1919, Rev. Zool. Africaine, VII, p. 23; 1920, Proc. Zoöl. Soc. London, p. 284.

Eighteen specimens of *Thrasops* are referred to this species: A. M. N. H. Nos. 12138, 12287, 12288–89 (October and November 1909), 12293, 12295 (September 1913), 12296 (November 1913), 12141–42 (January and May 1914), Avakubi; 12290 (June 1910), 12139–40, 12291 (September 1910), 12297–98 (June 1914), Medje; 12252, 12292 (November and December 1910), Niangara; 12143 (tag corroded), Belgian Congo.

The distribution of *Thrasops jacksoni* is puzzling, for it is absent in the Cameroon-Gaboon Forest, abundant in the Ituri Forest, and reappears in theLiberian Forest Area (French Guinea to Togo) and to the south of the Rain Forest proper along the Kasai. *Thrasops flavigularis* appears to replace it in the Gaboon region, but the two species occur together in the Liberian Forest Area.

The largest male measures 1900 mm., the largest female 2160 mm. The tail length varies from .28–.31 of the total in both sexes, mean .29 in twelve females, .30 in six males. The ventrals range from 192–205, mean 199 in males, and from 206–211, mean 208 in females. The subcaudals range from 144–152, mean 147 in males, from 135–155, mean 143 in females. In one specimen the dorsal scale rows are 19–17–13, and in one 21–21–13, all others 19–19–13. The large preocular frequently is semi-divided, and is entirely divided in three specimens, on one of which there are three preoculars on each side. Postoculars uniformly 3, one specimen having 4 on one side. Temporals 1–1 in every specimen. Upper labials invariably 8, lower 10–12. Parietals as long as the frontal or longer.

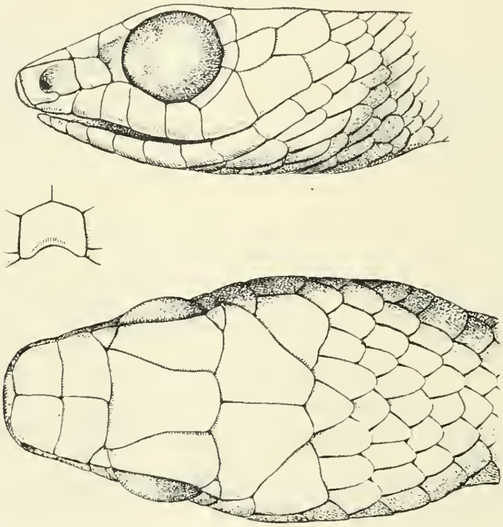


Fig. 6. Dorsal and lateral views of head and front view of rostral of *Thrasops jacksoni* Gunther, (12144, × 2).

Twelve specimens, ranging from 1235 mm. to the largest, are black, with a grayish throat. In the smallest of these, faint marbling of the ventrals and lighter spots on the dorsal scales are distinguishable under alcohol. In six specimens from 643–1313 mm. a spotted coloration, as in juvenile *Thrasops flavigularis*, is exhibited. In No. 12141 the throat is bright yellow, extending to about the fifteenth ventral. Posterior to this the ventrals are marked with black and yellow, alternately disposed, a ventral which is black-yellow-black-yellow-black, from side to side, being followed by one which is yellow-black-yellow-black-yellow, though not with perfect regularity. Each subcaudal has a round yellow spot alternately on the inner and outer part of the scale. The top of the head is olive, the neck yellow with black-tipped scales, its sides orange. On the body the black predominates with groups of yellow or partly yellow scales arranged alternately, producing a more or less vertically barred appearance.

The relationship of the present species with *Thrasops rothschildi* Mocquard, from Kenya Colony (possibly Uganda?) and Mt. Kenia is close. In the specimens of that species so far described there are 17 rows of scales, and 173–178 ventral plates. Mocquard's description (1905, Bull. Mus. Hist. Nat., Paris, XI, p. 287) states that the rostral is wider than high and that the frontal is longer than the parietals. This latter character is well shown in Lönnberg's figure (1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 22, Fig. 4), in which the parietals are considerably shorter than in the present species. The tail in *T. rothschildi* measures .32–.33 of the total, slightly longer than in *T. jacksoni*. The absence of the yellow throat of *T. flavigularis* also relates *T. rothschildi* to *T. jacksoni*. The difference in scale rows is the most important distinction, but one of the present series has only 17. Should the type of *T. rothschildi* have come from Uganda, it is practically certain that it is synonymous with *T. jacksoni;* in which case the two specimens recorded from Mt. Kenia by Lönnberg (*loc. cit.*) probably represent a distinct, though closely allied, form.

CORONELLA Laurenti

Coronella coronata (Schlegel)

Calamaria coronata SCHLEGEL, 1834, 'Phys. Serp.,' II, p. 46.

Coronella coronata JAN, 1863, Arch. Zool. Anat. Phys., II, p. 254. BOULENGER, 1894, 'Cat. Snakes,' II, p. 196. WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 399. MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 415. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, IV, p. 215. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 284. CHABANAUD, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 469.

Three specimens were collected in the Sudan: A. M. N. H. No. 11910 (April 1913), Bafuka; 12299 (February 1911), Faradje; 11909 (November 1910), Niangara.

The species *coronata* is characteristic of the Sudanese Subprovince ranging from Senegal nearly to the Nile. It has previously been recorded from Togo, so that the present records represent an enormous extension of its range. *Coronella regularis* has been recorded from Uganda

(Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 165), and evidently also ranges throughout the Sudan. *C. semiornata* is East African, ranging south to Mozambique and north into Kenya Colony, where it gives off an allied species, *C. scheffleri* Sternfeld.

The three specimens agree closely in scale characters, but offer some difficulty in identification, agreeing best with *C. coronata* in scale characters and with *C. regularis* in coloration, especially in having a dark venter. It seems very probable that *C. regularis* is referable to *C. coronata*, the differences in coloration being rather less than in many other African species. There are four lower labials in contact with the anterior chin shields, and the narrow temporal and long frontal distinguish it also as *C. coronata*.

The dorsal color is black, the scales narrowly light-edged; the venter is dark gray, the throat light yellow. In the smallest specimen the dorsal scales are brown, the ventrals lighter in the middle, the throat white. The head pattern is the same in two specimens, but more sharply defined in the smaller. The black ground color is crossed by a narrow light line on the posterior border of the prefrontals and the preoculars; by a similar line on the anterior border of the parietals and the postoculars; by a third narrow line just behind the parietals, broadening on the side of the neck; a nuchal white band, about twice as wide as the anterior crosslines, on the neck about seven scales distant from the parietals; and a final ill-defined light band separates the second nuchal black area from the dorsal brown. These lines all join the light throat color, which extends onto the upper labials. The eye is very narrowly rimmed with black. The largest specimen has lost the head pattern entirely, and is uniform brownish black above and below, with the exception of the throat and chin shields, which are gray.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12299	11909	11910
Sex	♀	♂	♂
Length	640	378	205 mm.
Tail	121	80	44 mm.
Tail/Length	0.19	0.21	0.21
Ventral Plates	195	182	181
Subcaudals	74	70	64
Dorsal Scales	19–19–17	21–19–17	19–19–17
Preoculars	1	1	1
Postoculars	2	2	2
Temporals	1–2	1–2	1–2
Upper Labials	8	8	8
Lower Labials	9	9	9

PROSYMNA Gray

Prosymna ambigua Bocage

Prosymna ambiguus BOCAGE, 1874, Jorn. Sci. Lisboa, (1) IV, p. 218.

Prosymna ambigua BOULENGER, 1894, 'Cat. Snakes,' II, p. 248; 1896, III, p. 641. BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 93. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 71. BOULENGER, 1902, Proc. Zoöl. Soc. London, II, p. 17; 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, part 3, No. 12, p. 11; 1908, Ann. Natal Mus., I, p. 229; 1910, Ann. S. African Mus., V, p. 509. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 208, 625. CHABANAUD, 1916, Bull. Mus. Hist. Nat., Paris, XXII, pp. 372, 439. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 285.

Prosymma ambigua (misprint) BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 25.

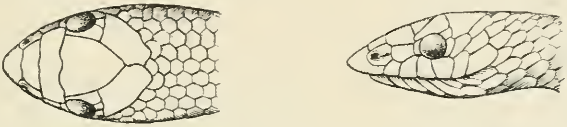


Fig. 7. Dorsal and lateral views of head of *Prosymna ambigua* Bocage, (12145 × 2), showing modification of rostral and frontal shields for burrowing.

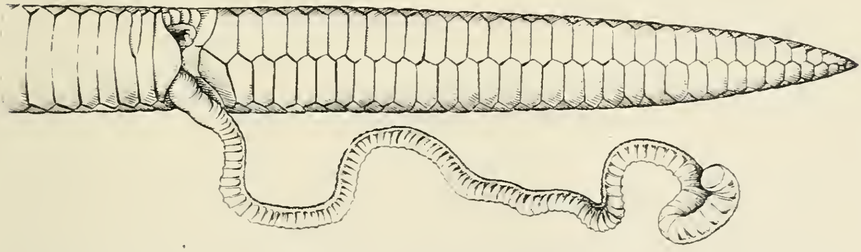


Fig. 8. Ventral view of tail of *Prosymna ambigua* Bocage, (12145, × 2), showing extended hemipenis.

Two specimens of *Prosymna ambigua* were secured at Garamba, A. M. N. H. Nos. 12144–45 (June and July 1912). It appears to be a species of the South and East African Subprovince, ranging into the eastern Sudan. It has not been reported from the savannah of Cameroon and Togo. The record of a single specimen from the Rain Forest at Avakubi, in the Christy collection (Boulenger, 1919, p. 25), requires verification.

This species has the typical habitus of burrowing forms, with the shovel-shaped rostral, small eyes, cylindrical body, and short tail. One specimen has a small anterior supplementary loreal, cut off from the nasal.

The extended hemipenis is remarkable in being unforked, and longer than the tail by at least ten millimeters. It is obviously "telescoped" when withdrawn, as is indicated by the transverse folds. Its great relative length may be due to a reduction in tail length undergone by this form with the adoption of burrowing habits.

The coloration is bluish gray above and below, each of the dorsal scales with a lighter gray spot.

Measurements and Scale Characters

A. M. N. H. No.	12144	12145
Sex	♀	♂
Length	252	298 mm.
Tail	36	48 mm.
Tail/Length	0.14	0.16
Ventral Plates	148	139
Subcaudals	30	32
Dorsal Scales	19–15–15	20–15–15
Preoculars	1	1
Postoculars	2	2
Temporals	1–2	1–2
Upper Labials	6	6
Lower Labials	8	8

Scaphiophis Peters

Scaphiophis albopunctatus Peters

Plate VIII

Scaphiophis albopunctatus Peters, 1870, Monatsber. Akad. Wiss. Berlin, p. 645, Pl. i, fig. 4. Boulenger, 1894, 'Cat. Snakes,' II, p. 254; 1896, III, p. 641. Bocage, 1895, 'Herpétol. Angola,' p. 102. Günther, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 526. Bocage, 1896, Jorn. Sci. Lisboa, (2) IV, p. 83. Boulenger, 1896, Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 553; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 279. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 71. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 446. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1873. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, IV, p. 243. Pellegrin, 1909, Bull. Soc. Zool. France, XXXIV, p. 204. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 165; 1915, Proc. Zoöl. Soc. London, pp. 209, 626, 649. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 372; 1917, XXIII, p. 11. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 25; 1920, Proc. Zoöl. Soc. London, p. 285.

Seven specimens of *Scaphiophis* were collected as follows: A. M. N. H. No. 12151 (March 1911), Faradje; 12146–49, 12150 (November and December 1910), Niangara; 12152 (November 1911), Yakuluku.

The distribution of this form is interesting. It ranges entirely around the borders of the forest from the Lower Congo and the Kasai to Tanganyika Territory, and from Dahomey to Eritrea. Most of the forms with a forest-border distribution do not reach the Abyssinian Subprovince. Boulenger's records from Stanleyville and Avakubi do not seem logical and require verification.

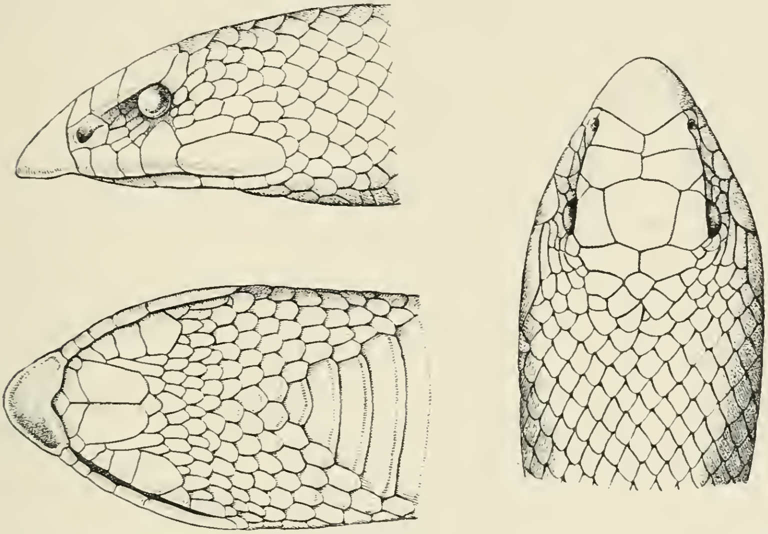


Fig. 9. Dorsal, lateral, and ventral views of head of *Scaphiopus albopunctatus* Peters, (12147, × 1). Modifications for burrowing are seen in the spade-like rostral and the valve-like closure of the jaws.

The development of the rostral for burrowing reaches an extreme in this species. The lower jaw closes with a valve-like precision, and the mental has a projection, with a horn-like tip, which fits into a corresponding emargination of the rostral. The upper labials are reverted and project well below the labial border.

The largest male measures 984 mm., the largest female 1367 mm. (an exceptional size). The tail length in three males ranges from .18–.19 of the total, in three females from .14–.16 of the total. The sexes are very distinct in number of ventral plates, 185–189 in males, 216–224 in females, both figures rather low in comparison with the range 212–240 given by Boulenger (1894, p. 254). The subcaudals in males are 64–69, in females 58–66. The dorsal scale count ranges from 23–21–17 to 25–23–19. The scales about the eye, exclusive of the supraocular, are somewhat irregular in arrangement, numbering from three to eight, usually two preoculars, two suboculars and two postoculars. The temporal scales are small, four or five in the first row. Two superposed loreals. The parietals are very short, followed by small scales in two specimens, by 1–3 occipitals in five. Upper labials 5, lower 8–9.

The two smaller specimens are nearly uniform brown above, lighter beneath, with scattered light spots above. The adults are grayish brown with numerous black scales above. The head shields are brown, spotted with black.

GRAYIA Günther

SYNOPSIS OF THE SPECIES

A.—Dorsal scales in 15 rows; habitus slender, tail more than .4 of the total length.
  B.—Subcaudals 100–128; a black bar on the temporals, continuous with the black edge between the last two labials. Lake Region, Sudan, *thalloni*.
  BB.—Subcaudals 142–161; a white line from the angle of the mouth to the corner of the parietals. Rain Forest.................. *cæsar*.
AA.—Dorsal scales in 17–20 rows; habitus stout, tail less than .4 of the total length.
  B.—Lower anterior temporal longer than its distance from the loreal; seven upper labials; venter light, tail light beneath, with longitudinal dark lines on the borders of the subcaudals. Rain Forest, Sudan, Uganda.................................... *smythii*.
  BB.—Lower anterior temporal shorter than its distance from the loreal; eight or nine upper labials; venter darkening posteriorly, tail entirely dark beneath. Rain Forest, Sudan, and northern Angola, *ornata*.

Grayia ornata (Bocage)

Plate IX, Figure 1

Macrophis ornatus BOCAGE, 1869, Jorn. Sci. Lisboa, (1) I, p. 67.

Grayia ornata BOCAGE, 1895, 'Herpétol. Angola,' p. 104; 1897, Jorn. Sci. Lisboa, (2) IV, p. 200. MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 8. BOULENGER, 1910, Proc. Zoöl. Soc. London, 1909, p. 944, figs. 295, 296; 1915, p. 207; 1919, Rev. Zool. Africaine, VII, p. 24; 1920, Proc. Zoöl. Soc. London, p. 284.

Grayia smythii (part) BOULENGER, 1894, 'Cat. Snakes,' II, p. 286. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 138. BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 453. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, pp. 409, 426; IV, pp. 216, 231.

Grayia smythii (*non* Leach) WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 344. BOULENGER, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 213.

Grayia furcata BOULENGER, 1894, 'Cat. Snakes,' II, p. 287.

Grayia striata STERNFELD, 1910, Mitt. Zool. Mus. Berlin, V, p. 69.

Twenty-one specimens of this species, representing both color forms, were collected: A. M. N. H. No. 12164 (December 1913), 12177 (December 1915), Avakubi; 12163, 12167 (February 1911), 12168 (March

1912), 12169, 12571 (January 1913), Faradje; 12160 (July 1910), Medje; 12161–62, 12165–66 (November 1910), Niangara; 12170–73, 12174 (November and December 1913), 12175–76 (January 1914), Niapu; 12178, 12570 (tags corroded), Belgian Congo.

Grayia ornata occurs in longitudinally striped and crossbarred color phases which are indistinguishable on any scale character, and occur throughout the same range. The species is known from the Cameroon-Gaboon Rain Forest, and reaches northern Angola. The present records give it a wide distribution throughout the Rain Forest, and five specimens from Faradje prove that it ranges far out into the Sudan along the streams which it inhabits. This is in marked contrast to the distribution of some of the other water reptiles, which are as closely confined to the continuous Rain Forest as any of the land forms (Schmidt, 1919, Bull. Amer. Mus. Nat. Hist., XXXIX, p. 401).

The twenty-one specimens of *Grayia ornata* agree closely with the description by Boulenger (1910, p. 944) except in having uniformly seventeen dorsal scale rows instead of 17–20–17, 17 in only five out of fifteen specimens examined by him. In adaption to its habitat, the tail is markedly compressed.

The largest male measures 1240 mm., the largest female 1385 mm. The tail length varies from .25–.32 in males, mean .28, and from .24–.26 in females, mean .25. The ventral plates range from 148 to 155, mean 153, in males, and from 153–160, mean 156, in females; subcaudals 69–87, mean 82, in males, 69–78, mean 74, in females. One preocular, two postoculars, and temporals 2–3 in every specimen. The lower anterior temporal is frequently separated from the postoculars. Five specimens have both loreals fused with the prefrontals, three have the loreal of one side fused. The upper labials number 8–10, the lower 10 or 11.

The longitudinally striped form is represented by three specimens, from Medje and Niangara. No. 12160 represents the extreme development, in the present series, of the longitudinal lines. The light ventral color extends on the sides to the middle of the third scale row. Two interrupted black lines are distinct on this ground color, one on the ends of the ventrals and the first scale row, a second between the first and second scale rows. These lines consist of streaks six or seven scales in length, with interspaces of two or three scales. The upper half of the third scale row, the fourth, and the lower half of the fifth are occupied by a black band extending from the last upper labial. Between the seventh and eighth scale rows on each side is a fourth black line, with several cross-connections on the neck. All of these lines are more or less indistinct behind the anterior third of the body, the broad lateral band alone continuing, as a row of spots, to the tail. A black nuchal bar connects the two lateral bands. The venter darkens posteriorly, and the tail is entirely dark gray beneath.

In No. 12161 the pattern is the same except for the entire absence of the narrow black line between the first and second scale rows.

In No. 12162 both lateral lines are very faintly marked, and the dorsal entirely indistinct, but the broad black lateral band is as distinct as in the other two specimens.

In No. 12163 the dorsum is entirely brown, each scale mottled with black.

In all of these specimens the throat is gray with longitudinal light streaks, the lower labials with round light spots, and a light spot on the fourth or fifth upper labial.

The throat coloration, the nuchal crossbar, and the coloration of the venter are identical with the coloration of the crossbarred form, which has been excellently described by Boulenger (1910, p. 944, Figs. 295–296). The number of crossbars in the present series ranges from 24–30, the range in the series examined by Boulenger being 21–25. In some specimens the posterior bars are entirely obscured by the general darkening of the ground color, but usually the inverted Y-shaped ends of the bars can be traced to the tail. Half-grown specimens show the intermediate condition figured by Boulenger (*loc. cit.*) in the development of the adult pattern.

Grayia smythii (Leach)

Coluber smythii Leach, 1818, in Tuckey's, 'Expl. River Zaire,' App., p. 409.

Grayia smythii (part) Boulenger, 1894, 'Cat. Snakes,' II, p. 286, Pl. xiii, fig. 3; 1896, III, p. 643. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 138. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 453. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, pp. 409, 426; IV, pp. 216, 231.

Grayia smythii Günther, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 525; 1896, (6) XVII, p. 264. Boulenger, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 279. Sjöstedt, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 25. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 78. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 446. Schenkel, 1902, Verh. Naturf. Ges. Basel, XIII, p. 163. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 334. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 43 Johnston, 1906, 'Liberia,' II, p. 832. Boulenger, 1910, Proc. Zoöl. Soc. London, (1909), p. 948, figs. 297, 298. Klaptocz, 1913, Zool. Jahrb. (Syst.), XXXIV, p. 286. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 207, 625. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 372. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 24; 1920, Proc. Zoöl. Soc. London, p. 285.

Grayia smithi Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 469.

Eight specimens of this species were collected: A. M. N. H. Nos. 12153–54 (October 1909), 12155, 12156–57 (September and December 1913), Avakubi; 12159 (February 1911), Faradje; 12158 (January 1910), Gamangui; 12179 (June 1913), Niangara.

Grayia smithii is a forest species extending into East Africa in Uganda and following the rivers in which it lives into the savannah.

Grayia smithii reaches a considerably larger size than *G. ornata*. The largest male measures 1535 mm., the largest female 1350 mm. (tail incomplete). The tail length in three males varies from .29–.33 of the total; in the single female with a complete tail it is .29. Ventral plates range from 149–160 in males, from 157–162 in females; subcaudals 90–96 in males, 92 in the female. Dorsal scales 17–17–15, 19 on the neck on one specimen. One preocular, two postoculars, and temporals 2–3 in all specimens. Three or four slightly enlarged occipitals. Upper labials 7, the last very large, lower 10 or 11.

In the present series the single juvenile specimen is colored exactly as in the figure by Boulenger (1910, p. 947, Fig. 298); there are twenty-three of the narrow light crossbands, with the indications on the sides of eleven more. In the adults the crossbars are black, always with a row of light spots on the black scales, more or less in the middle of the bar. In two specimens more than thirty such bars are visible, the posterior ones merely indicated dorsally. In other specimens the color becomes entirely uniform on the posterior two-thirds of the body, with ten or twelve crossbars anteriorly. The scales of the tail are outlined with black, giving it a longitudinally lined effect, and a similar line edges the venter. The throat is white, the lower labials black-edged. The parietal shields are gray, with black borders.

Grayia tholloni Mocquard

Grayia tholloni Mocquard, 1897, Bull. Soc. Philom. Paris. (8) IX, p. 11. Boulenger, 1901, Ann. Mus. Congo, (1) II, p. 17; 1902, in Johnston, 'Uganda Protectorate,' p. 446. Werner, 1908, 'Rept. Wellcome Res. Lab.,' III, p. 170. Boulenger, 1910, Proc. Zoöl. Soc. London, (1909), p. 951, fig. 299; 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 165; 1915, Proc. Zoöl. Soc. London, pp. 625, 649; 1920, p. 285.

Grayia fasciata Boulenger, 1901, Ann. Mus. Congo, (1) II, p. 9, Pl. iii, fig. 2.

Two specimens of *Grayia tholloni* come from localities in the Sudan: A. M. N. H. No. 12180 (February 1911), Faradje; 12181 (March 1912), Garamba.

This species appears to be confined to the eastern Sudan, where it replaces *G. cæsar* of the Rain Forest.

In both specimens the tail is incomplete, and they were first identified with *G. cæsar*, from which, however, the head pattern at once distinguishes them, as well as the fact that the fifth labial instead of broadly entering the eye is separated from it by the lower postocular or enters the eye opening at a POINT, as on one side in one of the present specimens. *Grayia cæsar* and *tholloni* agree in having much narrower postoculars than *G. smythii* and *ornata*, as well as in the larger eye.

Color grayish brown above, with very indistinct light crossbars. Venter and under side of tail immaculate light yellow, outlined with black at the juncture with the dorsal color. Upper and lower labials black-edged, the black between the last two upper labials continued upward as a bar across the temporals (exactly as figured by Boulenger, 1910, p. 951, Fig. 299).

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12180	12181
Sex	♀	♂
Length	410+	670+ mm.
Ventral Plates	145	138
Dorsal Scales	15–15–15	15–15–15
Preoculars	1	1
Postoculars	2	2
Temporals	2–3	2–3
Upper Labials	8	8
Lower Labials	9	9

Grayia cæsar (Günther)

Plate IX, Figure 2

Xenurophis cæsar GÜNTHER, 1863, Ann. Mag. Nat. Hist., (3) XII, p. 357, Pl. VI, fig. C. BOULENGER, 1894. 'Cat. Snakes,' II, p. 288. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 139. BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 43. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 409.

Grayia cæsar BOULENGER, 1910, Proc. Zoöl. Soc. London, (1909), p. 944; 1915, p. 208; 1919, Rev. Zool. Africaine, VII, p. 24; 1920, Proc. Zoöl. Soc. London, p. 285.

A single specimen of this remarkable species, A. M. N. H. No. 12182 (November 1913), was taken at Niapu.

Grayia cæsar seems to be closely confined to the Rain Forest. It is known from only a few specimens from Gaboon and Cameroon, and reaches Fernando Po. The present record indicates that it is widely distributed throughout the eastern division of the forest.

The specimen, a female, agrees with Boulenger's description except in having only two posterior temporals. The color is grayish brown above, with thirty light, narrowly black-edged crossbars, occasionally interrupted on the vertebral line. Tail faintly crossbarred. Venter entirely uniform grayish yellow. Lower labials immaculate, except the last. Upper labials light, with dark markings mostly on the sutures. Top of head black, a faint light spot on each parietal, and still fainter ones on the frontal. A light postocular line, followed by a sharply defined one from the angle of the mouth to the posterior corner of the parietals.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12182
Sex	♀
Length	1155 mm.
Tail	555 mm.
Tail/Length	0.48
Ventral Plates	141
Subcaudals	142
Dorsal Scales	15–15–15
Preoculars	1
Postoculars	2
Temporals	2–2
Upper Labials	8 (fourth and fifth entering the eye)
Lower Labials	9

Dasypeltinæ

DASYPELTIS Wagler

Dasypeltis scaber (Linnæus)

Coluber scaber LINNÆUS, 1766, 'Syst. Nat.,' I, p. 384.

Dasypeltis scaber SMITH, 1849, 'Ill. Zoöl. S. Africa, Rept.,' Pl. LXXIII.

Dasypeltis scabra BOULENGER, 1894, 'Cat. Snakes,' II, p. 354; 1896, III, p. 648; Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 553; (2) XVII, p. 20. BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, pp. 78, 93; 1897, p. 210. DURHAM, 1896, Proc. Zoöl. Soc. London, p. 715, Pl. XXXII. BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 279; Proc. Zoöl. Soc. London, p. 801. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. SJÖSTEDT, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 25. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 78. WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 399. ANDERSON, 1898, Zool. Egypt, I, p. 278, Pl. XXXIV, fig. 3, XXXIX. BOULENGER, 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 720. KATHARINER, 1898, Zool. Jahrb. (Anat.), XI, p. 501, Pl. XLI. BOULENGER, 1902, Proc. Zoöl. Soc. London, II, p. 17; in Johnston, 1902, 'Uganda Protectorate,' p. 447. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 340, 345. FERREIRA, 1903, Jorn. Sci. Lisboa, (2) VII, p. 10. BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 180; Proc. Zoöl. Soc. London, II, p. 255. FERRIERA, 1905, Jorn. Sci. Lisboa, (2) VII, p. 115; 1906, (2) VII, p. 168. JOHNSTON, 1906, 'Liberia,' II, p. 832.

Boulenger, 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, part 3, No. 12, p. 11. Roux, 1907, Zool. Jahrb. (Syst.), XXV, p. 735. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1873. Boulenger, 1898, Ann. Natal Mus., I, p. 229; Ann. Mus. Stor. Nat. Genova, (3) IV, p. 5. Gough, 1908, Ann. Transvaal Mus., I, p. 26. Ohdner, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 5. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 409; IV, p. 216. Boulenger, 1909, Ann. Mus. Stor. Genova, (3) IV, p. 303. Chubb, Proc. Zoöl. Soc. London, p. 595. Boulenger, 1910, Ann. S. African Mus., V, p. 509. Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 15. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 442. Roux, 1910, Rev. Suisse Zool., XVIII, p. 99. Sternfeld, 1910, Mitt. Zool. Mus. Berlin, V, pp. 55, 58. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 165; 1912, p. 332. Sternfeld, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 250. Peracca, 1912. Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 5. Sternfeld, 1912, 'Wiss. Ergeb, Deutsch. Zentr. Afrika Exp.,' IV, p. 271. Boettger, 1913, 'Wiss. Ergeb. Reise Ost-Afrika, Voeltzkow,' III, p. 361. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 162. Lönnberg and Andersson, 1913, Ark. Zool., Stockholm, VIII, No. 20, p. 4. Sternfeld, 1913, Sitzber Ges. Naturf. Freunde Berlin, p. 109, figs. 3–7. Werner, 1913, in Brehms 'Tierleben,' 4th Ed., V, p. 385. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 373. Loveridge, 1916, Journ. E. Africa Uganda Nat. Hist. Soc., V, No. 10, p. 79; 1918, No. 13, p. 381. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 25; 1920, Proc. Zoöl. Soc. London, p. 256.

Dasypeltis scabra fasciolata Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 334. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 214.

Dasypeltis scabra atra Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 272.

Dasypeltis scaber scaber (Linnæus)

Plate III, Figure 2

The twenty specimens of *Dasypeltis* in the Congo collection fall into three groups. A single specimen, A. M. N. H. No. 12188 (August 1913), taken at Poko, on the forest border, agrees in coloration with the typical form. The specimens secured within the borders of the Rain Forest are referable to *D. macrops*, and those from the savannah represent the variety *palmarum* of *D. scaber*. Consideration of the color variations enumerated by Boulenger (1894, p. 355) leads to the conclusion that they represent only two groups, one uniform brown and the other variously spotted, with an intermediate form which might well be a hybrid. The conclusion that these are two distinct species which occasionally interbreed is tempting but requires much more thorough examination. The variety *atra* Sternfeld, moreover, does not fit into either of these categories.

The spotted form ranges from Lower Egypt to Portuguese Guinea, and southward throughout Africa south of the Rain Forest.

The specimen, a female, measures 557 mm., tail 76 mm., .14 of the total. Ventral plates 225, subcaudals, 57, dorsal scales 23–25–21. One preocular, two postoculars, temporals 2–3 on each side. Upper labials 7, lower labials 8, 3 in contact with the anterior chin shields.

The color pattern is well defined. On a light grayish brown there are 55 dorsal rhombic markings of dark brown, three to five scales long, and six or seven scale rows wide, with interspaces of only a scale or a scale and a half (longitudinally). On the sides are vertical bars of the same color corresponding somewhat to the dorsal rhombs, and frequently confluent with them, especially anteriorly, but rarely opposite each other. The anterior dorsal markings are drawn out into V's, parallel with a V which has its apex on the posterior angle of the frontal. There are three transverse dark lines on the head anterior to this V, one of which forks laterally with a branch across the temporals and one just behind the eye to the labial border. All of the labial sutures are dark-edged. Venter yellowish, grayish anteriorly, shaded at the sides.

Dasypeltis scaber palmarum Leach

Dasypeltis palmarum Leach, 1818, in Tuckey's 'Expl. River Zaire,' App., p. 408.

Dasypeltis scabra palmarum Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 139. Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 112. Werner, 1913, in Brehms 'Tierleben,' 4th Ed., V, p. 386, Pl. vii, fig. 4. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 373; 1917, XXIII, p. 12.

Dasypeltis macrops Chabanaud (*non* Boulenger), 1918, Bull. Mus. Hist. Nat., Paris, XXIV, p. 165.

Ten specimens from the Uele District: A. M. N. H. No. 12201 (April 1911), Faradje; 12202 (June 1912), Garamba; 12193–200 (November 1911), Niangara.

Dasypeltis scaber palmarum, whatever its specific status, has a wide range in the Savannah Province, with no discovered distinction from that of the typical form except its absence in northeast and in southwest Africa.

The largest male measures 512 mm., the largest female 789 mm. The tail length in males varies from .16–.18 of the total, in females it is uniformly .13. The ventral plates number 203–216 in males, 221–234 in females; the subcaudals respectively 68–71 and 58–61. The dorsal scale count varies from 23–25–19 to 27–27–25, usually 25 at mid-body. A single preocular except in one specimen with two on one side. Two postoculars. Temporals 2–3 or 2–4, one specimen aberrant in having the lower temporal on one side and both on the other fused with the fifth labial. Labials seven, above and below, except in one specimen in which the upper labials are 5–6.

The color is uniform, slightly reddish brown, somewhat lighter on the venter. One specimen exhibits the coloration "C" of Boulenger, with faint darker crossbands. A juvenile specimen with the umbilical scar still evident (287 mm.) differs in no way from the adults.

The eggs in a large female from Niangara (November) are very large and entirely fill the body cavity, so that one ovary is anterior to the other, and the ends of the eggs are pressed in, making them nearly cylinders. The posterior viscera are very much crowded together on the dorsal side. The eggs, 5+6 in number, measure 13×23 mm. The alimentary canal is empty save for a few fragments of egg shell.

Dasypeltis macrops Boulenger

Dasypeltis macrops Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XIX, p. 324. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 410. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 603. Boulenger, 1920, Proc. Zoöl. Soc. London, p. 286. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 469.

Nine specimens are referable to this species: A. M. N. H. No. 12184 (September 1909), Batama; 12190–91 (April 1914), Medje; 12187 (July 1913), Nala; 12185–86 (November 1910), Niangara; 12189 (December 1913), Niapu; 12183 (August 1909), Stanleyville; 12192 (tag corroded), Belgian Congo.

Dasypeltis macrops is evidently confined to the Rain Forest, where it replaces the various forms of *D. scaber* of the savannah.

The largest male measures 660 mm., the largest female 820 mm. The tail length in males varies from .17–.19 of the total, in females from .15–.16 (compare with *D. scaber palmarum* above). The ventral plates range from 233–242 in males, 244–253 in females; subcaudals 75–81 and 70–73 respectively. The dorsal scale count is 25–21–19 to 27–25–23, 25 at mid-body in four, 23 in four, and 21 in one specimen. One specimen has two preoculars on each side, another has a single postocular on one side. The temporals are 2 or 3 in the first row, 3 or 4 in the second. Seven upper labials, and seven or eight, usually eight, below.

The series in question is amply distinct from *Dasypeltis scaber.* The eye is larger; the frontal is larger, with parallel instead of convergent sides; the parietals are wider and more rounded behind; the suture between the internasals equals or exceeds that between the prefrontals. The difference in number of ventrals is striking, especially when the respective sexes are compared, but Boulenger (1894, p. 355) records a much wider range of variation in this character than appears in the present specimens. The number of dorsal scale rows is not a good character for the separation of the species.

The coloration is very uniform, olive-green with narrow yellow crossbands, the lower scale rows outlined with black, the head shields ornamented with black markings. Venter uniform olive-green, the ventrals in some cases with a yellow lateral edge.

Boiginæ

GEODIPSAS Boulenger

Geodipsas depressiceps (Werner)

Tropidonotus depressiceps WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 402; 1899, XLIX, p. 135. BOULENGER, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 211.

Geodipsas depressiceps STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 410. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 604. WERNER, 1913, Mitt. Naturh. Mus. Hamburg, XXX, p. 27. BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 25.

Geodipsas manpajensis ANDERSSON, 1901, Bihang Svenska Vetensk.-Akad. Handl., XXVII, part 4, No. 5, p. 19, Pl. II, fig. 15.

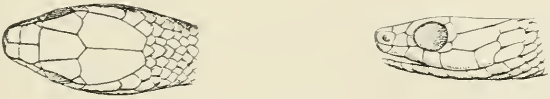


Fig. 10. Dorsal and lateral views of head of *Geodipsas depressiceps* (Werner), (12208, × 2).

Nine specimens in the collection: A. M. N. H. No. 12204 (October 1909), Ambelakudi; 12203 (September 1909), Batama; 12209, 12211 (June 1914), 12210 (July 1914), Medje; 12205–06, 12207 (November and December 1913), 12208 (January 1914), Niapu.

Geodipsas depressiceps is evidently one on the characteristic species of the forest, ranging from Cameroon to the Ituri.

The largest male in the series measures 280 mm., the largest female 280 mm., the tail respectively 46 and 36 mm. The tail length varies from .16–.17 of the total in six males, from .13–.14 in three females. The ventral plates range from 140–143 in the males, 146–147 in the females; subcaudals 37–41 in males, 32–36 in females. The dorsal scales are 19–19–17. Two pre- and two postoculars. Temporals 1–2, exceptionally 1–3. Supralabials normally 7, 8 in one specimen; infralabials 8 or 9.

Coloration as well as scutellation is very constant in this species. A dark brown vertebral line, very distinct posteriorly, breaks up anteriorly into a more or less distinct double row of spots, which may be somewhat confluent, forming a zigzag line. The sides from the first to the middle of the sixth scale row are dark brown, usually bordered on the sixth scale row by black, and sometimes with a faint black line on the top of the first scale row. Between the sixth scale row and the dorsal line the color is much lighter grayish brown. Venter bright yellow, with a black lateral line, which is interrupted anteriorly, with a spot on each ventral. The tips of the ventrals brown like the sides, in one specimen without the black ventral lines, the lateral brown extending as far as the line normally does. Ventrals between the black lines uniform yellow in two specimens, more or less heavily shaded posteriorly in the others. Head very dark brown, the labials yellow, heavily edged with brown on the sutures. A pair of very distinct adjacent light brown oval marks on the neck, with a vertical yellow mark on the sides below them.

BOIGA Fitzinger

Boiga pulverulenta (Fischer)

Plate X, Figures 1 and 2

Dipsas pulverulenta Fischer, 1856, Abh. Naturw. Ver. Hamburg, III, p. 81, Pl. III, fig. 1.

Dipsadomorphus pulverulentus Boulenger, 1896, 'Cat. Snakes,' III, p. 68. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 13. Sjöstedt, 1897, Bihang Svenska Vetensk.-Akad. Handl., XXIII, part 4, No. 2, p. 25. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 403; 1899, XLIX, p. 139. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 453. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 43. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 214. Johnston, 1906, 'Liberia,' II, p. 832. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 410; IV, p. 216. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 605. Nieden, 1914, Sitzber. Ges. Naturf. Freunde Berlin, p. 366. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 211. Chabanaud, 1917, Bull. Mus. Hist. Nat., Paris, XXIII, p. 452. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 26; 1920, Proc. Zoöl. Soc. London, p. 288. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 469.

Dipsadomorphus boueti Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 373.

Twenty-one specimens were secured at various localities in the forest: A. M. N. H. No. 12224 (September 1913), Akenge; 12215–16, 12217 (October and November 1909), Avakubi; 12218 (February 1910), Gamagui; 12219, 12220–21 (August and September 1910), 12226–28, 12229–32, 12233–35 (April, May and June 1914), Medje; 12222–23 (November 1910), Niangara; 12225 (December 1913), Niapu.

The present records extend the known range of *Boiga pulverulenta* throughout the Rain Forest. It is well known from the western area, and appears to be entirely uniform throughout its range.

The maximum size in this series is reached by a female of 1210 mm., the largest male measures 1082 mm. The sexes are not distinguishable by tail length, though the maximum number of subcaudals and the proportionately longest tail occur in a male. The tail length varies from .21–.24 of the total, mean .22. The ventral plates vary from 251–269, mean 259; the subcaudals from 108–126, mean 118. The dorsal scales are 19 at mid-body, 21–23 on the neck, and 15 posteriorly.

The lateral head shields are somewhat variable; the normal condition is one pre- and two postoculars, one loreal and temporals 2–2. In one specimen the temporals are 3–2, in one, 2–3; and in one the temporals are 1–2 on one side. One specimen has two preoculars on each side. One has the upper portion of the preocular fused with the supraocular on one side. In two specimens the loreal, by fusion with the lower portion of the preocular, enters the eye. In one the loreal is horizontally divided on one side. The upper labials are normally 8, rarely 9. Lower labials 10–13.

The coloration is very uniform in the series, but exhibits every degree of fading in the lateral ocellar rhombic markings. When these are entirely obsolete, their position is still indicated by a row of vertebral black spots and another at the edge of the venter, representing the ends of the rhombs.

A female taken in June 1914 contains well-developed eggs, 29× 11 mm.

"Coloration, in life, reddish brown above, head darker brown. Irregular dark gray lateral bars, wider in the middle, extend from the vertebral line to the venter, tipped above and below with black. A cream-colored central spot in the broad portion of each lateral bar. Faint narrow grayish crossbars between the wider ones, disappearing posteriorly. The wider crossbars are usually alternate, sometimes confluent on the back. Venter pinkish gray, heavily dotted with brown which forms two lines at the inner edges of the ventral edges of the ventral angle. These lines are more distinct beneath the tail" (H. Lang).

Boiga blandingii (Hallowell)

Plate X, Figure 3

Dipsas blandingii Hallowell, 1844, Proc. Acad. Nat. Sci. Phila., p. 170.

Dipsadomorphus blandingii Boulenger, 1896, 'Cat. Snakes,' III, p. 77. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 13. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 403; 1899, XLIX, p. 139. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 454; 1902, in Johnston 'Uganda Protectorate,' p. 447. Johnston, 1906, 'Liberia,' II, p. 832. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p.

411; IV, p. 217. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 605. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 166; 1915, Proc. Zoöl. Soc. London, pp. 211, 628. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, pp. 75, 373. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 26; 1920, Proc. Zoöl. Soc. London, p. 288. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française. p. 469.

Twenty specimens were secured from various localities in the forest: A. M. N. H. Nos. 12243–44 (September and October 1913), Akenge; 12237–38 (October 1909), 12248 (September 1913), Avakubi; 12239 (February 1910), Gamangui; 12236 (September 1910), 12247 (April 1914), Medje; 12240–41, 12242 (November and December 1910), 12253 (May 1913), Niangara; 12245, 12254 (November 1913), 12246 (December 1913), 12249 (January 1914), Niapu; 12251 (August 1909), 12255 (April 1915), Stanleyville; 12250, 12256 (tags corroded), Belgian Congo.

Boiga blandingii occurs throughout the Rain Forest, ranging into Uganda to the east of the present localities. It is an abundant snake in the Cameroon-Gaboon area, as well as in the Ituri, as evidenced by the number of specimens secured by the Congo Expedition.

The largest specimen, measuring 2290 mm., is a female; the largest male measures 2180 mm. The sexes are not distinguishable by tail length, which varies from .21–.25 of the total, mean .23. The ventral plates vary from 254–270, mean 263; the subcaudals from 120–134, mean 128. The dorsal scales, always 23 at mid-body and 15 posteriorly, vary from 23–27 on the neck, normally 25.

The temporals are very variable, 2–2 or 2–3, but divided into small or fused into large plates, differing in each individual. The postoculars are normally 2, 3 on one side in three specimens. The preoculars are normally 2, one on one side on one specimen. The prefrontals are united into a single transverse shield in two specimens.

The anal plate is said to be divided in *Boiga blandingii*, in all descriptions. Werner (1897, p. 403) records a single specimen with entire anal. In the present series, only five specimens have the divided anal, with indications of a groove in two others, but there is no indication of any correlation of other characters with this condition. The description of the species must be amended to "anal entire or divided," and the condition is obviously useless as a "key character."

The coloration is very variable, with two distinct phases. Four of the specimens examined are black, the throat and anterior portion of the venter yellow; each ventral is bordered with black on its posterior edge, the border increasing in width until the yellow is crowded out; the posterior two-thirds of the venter is uniform black. The remainder of the specimens are brownish, with more or less distinct wide dark cross-bars, confluent anteriorly, alternate posteriorly on the vertebral line.

Dipsadoboa Günther

Dipsadoboa unicolor Günther

Plate XI, Figure 1

Dipsadoboa unicolor Günther, 1858, 'Cat. Snakes,' p. 183. Boulenger, 1896, 'Cat. Snakes,' III, p. 81. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 13. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 399; 1899, XLIX, p. 140. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 454. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 345. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 43. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 214. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 412; IV, p. 217. Müller, 1910, Abh. Bayer. Akad. Wiss, 2Kl., XXIV, p. 607. Despax, 1911, in Cottes, 'Mission Cottes au Sud Cameroun,' p. 239. Klaptocz, 1913, Zool. Jahrb. (Syst.), XXXIV, p. 286. Nieden, 1914, Sitzber. Ges. Naturf. Freunde Berlin, p. 366 Boulenger, 1915, Proc. Zoöl. Soc. London, p. 211; 1919, Rev. Zool. Africaine, VII, p. 26; 1920, Proc. Zoöl. Soc. London, p. 288. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 469.

Twenty-seven specimens of *Dipsadoboa unicolor* attest its abundance in the Ituri Forest: A. M. N. H. No. 12487 (August 1913), Avakubi; 12488, Gama Gama; 12458, 12459 (August and September 1910), 12466, 12467–72, 12474–82 (March, April and June 1914), Medje; 11987 (December 1910) Niangara; 12460, 12462–63 (November and December 1913), 12465 (January 1914), Niapu; 12489, 12541 (tags corroded), Belgian Congo.

This species is plainly a forest inhabitant, and apparently it replaces *Leptodeira hotambœia* of the savannah in feeding on the forest toads. It is known from western localities in the forest from Sierra Leone to the Congo, but had not previously been recorded from the upper Congo.

The series is remarkably uniform in scale characters as well as in coloration. The largest male measures 925 mm., tail 171 mm., the largest female 892 mm., tail 167 mm. The proportionate tail length in males varies from .18–.21, mean .19; in females from .16–.19, mean .17. The males have a slightly lower number of ventral plates and higher number of subcaudals than the females: ventrals 191–205, mean 196, subcaudals 64–73, mean 68, in males; 197–207, mean 202, and 62–70, mean 67, in females. The dorsal scales are uniformly 17 at mid-body, 13 posteriorly, and 15–19 on the neck. Preoculars and postoculars 1 and 2 respectively. Temporals usually 1–2, the anterior divided in four specimens, making 1–1–2; in four specimens there is only one posterior temporal on one side, and in one specimen there are three. There are 8 upper labials (9 in three specimens) and 10–12 lower, usually 11.

The coloration is dark greenish above, yellow beneath with the exception of the tail, which is dark, in all specimens. The upper labials are yellow from the first to the sixth, the seventh and eighth invariably dark.

The food seems to consist of various forest frogs and toads. Two specimens had swallowed specimens of a *Bufo,* two others are recorded as having disgorged frogs.

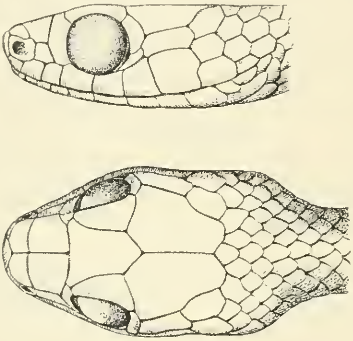


Fig. 11. Dorsal and lateral views of the head of *Dipsadoboa elongata* (Barbour), (12473, × 2).

Dipsadoboa elongata (Barbour)

Plate XI, Figure 2

Dipsodoboa unicolor (part) Boulenger, 1896, 'Cat. Snakes,' III, p. 183.
Crotaphopeltis elongata Barbour, 1914, Proc. New England Zoöl. Club, IV, p. 95.

Ten specimens are referred to this form: A. M. N. H. Nos. 12456–57 (February 1910), Gamangui; 12214, 12473, 12483–85 (June 1914), 12486 (July 1914), Medje; 12461, 12464 (November and December 1913), Niapu.

Two species appear to have been commonly confused under the name *Dipsadoboa unicolor*, one much more elongate and slender than the other. Comparing individuals of the same length and sex of *elongata* and *unicolor*, the greater length of the tail and especially the small head of the former are striking characters, and it does not seem possible to unite them as a single species. In the series at hand, there is a considerable discontinuity in the numbers of ventral plates and subcaudals.

The series is relatively uniform in all characters. Two specimens have three postoculars instead of the normal two; the lower labials are usually ten (eleven in *D. unicolor*); one specimen has temporals 1–3 instead of the normal 1–2 (1–1 in the type).

The ventral plates, subcaudals, and the tail length may be compared with the figures for *D. unicolor* as follows:

	D. unicolor	*D. elongata*
Ventral Plates ♂	191–205	219–230
Ventral Plates ♀	197–207	218–227
Subcaudals ♂	64 – 73	101–110
Subcaudals ♀	62 – 70	85[1]–100
Tail-length ♂	.18–.21	.23–.26
Tail-length ♀	.16–.19	.21–.24

Color dark brown above, slightly reddish on the sides, extending to the ends of the ventrals; venter uniform grayish yellow; subcaudals dark bluish gray, light-edged posteriorly; the ventral color extends on the upper labials from the angle of the mouth to the first labial, and reaches the eye. In the series of *D. unicolor*, the ventral color does not reach the eye or the seventh and eighth upper labials.

This species is probably a direct modification of *D. unicolor* for a more arboreal habitat. It would be interesting to know whether or not the food is exclusively amphibians, as appears to be the case with the ancestral species.

Leptodeira Fitzinger

Leptodeira hotambœia (Laurenti)

Plate XII, Figure 1

Coronella hotambœia, Laurenti, 1768, 'Syn. Rept.,' p. 85.

Leptodira hotombœia Boulenger, 1896, 'Cat. Snakes,' III, p. 89; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 279. Johnston, 1897, 'British Central Africa,' p. 316*a*. Peracca, 1897, Boll. Mus. Torino, XII, No. 273, p. 3. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 400. Mocquard, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 147. Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, pp. 406, 415. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 336, 345. Ferreira, 1903, Jorn. Sci. Lisboa, (2) VII, p. 12. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 214; Ann. Mag. Nat. Hist., (7) XVI. p. 112. Ferreira, 1905, Jorn. Sci. Lisboa, (2) VII, p. 116; 1906, p. 169. Boulenger, 1907, Proc. Zoöl. Soc. London, p. 487; Mem. Proc. Manchester Lit. Philos. Soc., LI, part 12, p. 11. Roux, 1907, Rev. Suisse Zool., XV, p. 77; Zool. Jahrb. (Syst.), XXV, p. 735. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1874, Pl. iii, fig. 7. Boulenger, 1908, Ann. Natal Mus., I, p. 229. Gough, 1908, Ann. Transvaal Mus., I, p. 27. Odhner, 1908, Ark. Zool., IV, No. 18.

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[1] 80 in the type.

p. 5. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 412, IV, pp. 217, 240, 243, 246. BOULENGER, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 309. CHUBB, 1909, Proc. Zoöl. Soc. London, p. 596. PELLEGRIN, 1909, Bull. Mus. Hist. Nat., Paris, XV, p. 414. ANDERSSON, 1910, Jahrb. Nassau. Ver. Naturk., LXIII, p. 203. BOULENGER, 1910, Ann. S. African Mus., V, p. 511. LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 15. MEEK, 1910, Publ. Field Mus. Zoöl., VII, p. 406. PERACCA, 1910, Boll. Mus. Torino, XXV, No. 624, p. 4. ROUX, 1910, Rev. Suisse Zool., XVIII, p. 99. STERNFELD, 1910, Mitt. Zool. Mus. Berlin, V, p. 64. WERNER, 1910, Denkschr. Med. Naturw. Ges. Jena, XVI, p. 358. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 166. LÖNNBERG, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 23. STERNFELD, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 250. PERACCA, 1912, Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 5. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Africa Exp.,' IV, p. 272. BOETTGER, 1913, 'Wiss. Ergeb. Reise Ostafrika, Voeltzkow,' III, pp. 348, 353, 361, 364. HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 163. LÖNNBERG AND ANDERSSON, 1913, Ark. Zool. Stockholm, VIII, No. 20, p. 4. WERNER, 1913, Mitt. Naturh. Mus. Hamburg, XXX, pp. 28, 45. PELLEGRIN, 1914, 'Doc. Sci. Miss. Tilho,' III, p. 126. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 210, 628, 651. CHABANAUD, 1917, Bull. Mus. Hist. Nat., Paris, XXIII, p. 12. LOVERIDGE, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 331. BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 25. WERNER, 1919, Denkschr. Akad. Wiss. Wien, math.-natur. Kl., XLVI, p. 503. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 287. CHABANAUD, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 469.

Thirteen specimens of *Leptodeira hotambœia* come from localities in the Sudan: A. M. N. H. Nos. 12301–02, 12544 (March 1911), Faradje; 12303, 12542–43 (June and July 1912), Garamba; 12300 (November 1910), 11992, 12304–06, 12307, 12308 (April, May, June and July 1913), Niangara.

Werner (1907, p. 1875) found typical *Leptodeira hotambœia* at Gondokoro, 150 miles northeast of the present localities, and supposed *L. attarensis* to be a northern offshoot of *hotambœia*. Boulenger (1915, p. 628) regards *attarensis* as synonymous with *L. degeni*, from Uganda (as suggested also by Werner), in which case there can be no possibility that it is a subspecies of *hotambœia*, although unquestionably closely related. The present localities unite the West African records (from Senegambia to Cameroon) with the East African.

The largest male measures 587 mm., the largest female 623 mm. The tail length in males varies from .13–.14 of the total, mean .14; in the females from .11–.13, mean .12. The ventral plates vary from 164–174, mean 169; the subcaudals in males range from 39–45, mean 42, in females from 35–39, mean 36. The dorsal scale count is 17–19–15, rarely 19 anteriorly. One preocular and two postoculars in every specimen. Temporals normally 1–2, 1–1 on one side in a single specimen. Postmentals normally 3, 3–4 in three specimens, 4–4 in two. The upper labials are 8, the lower 10. The loreal may be either slightly higher than long, or slightly longer than high. The character used by Werner to distinguish *attarensis,* the slenderness of the head, is reached in the same degree by half-grown specimens in the present series. Critical examination of a series of *L. degeni* with *hotambœia* from the same region may reduce *degeni* to synonymy, although Werner (1913, p. 28) has maintained the distinctness of *attarensis.* The number of ventrals is considerably higher in this series than the average in South African specimens, and more extensive collections may warrant subspecific division of *hotambœia.*

In coloration the series is very uniform and apparently distinct from *degeni,* for the lower scale rows, though pale, are never yellow and the black postocular mark is always present, though its distinctness varies. Two juvenile specimens have many of the scales white-edged.

A female taken in July contained 5 + 8 eggs, measuring 20 × 8 mm.

The stomachs of two specimens contained frogs too much digested for identification. The species is known to feed chiefly, if not exclusively, on batrachians.

Leptodeira duchesnii Boulenger

Plate XII, Figure 2

Leptodira duchesnii Boulenger, 1901, Ann. Mus. Congo, (1) II, p. 10, Pl. iv, fig. 1. Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 410. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1876. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 605. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 210; 1919, Rev. Zool. Africaine, VII, p. 26; 1920, Proc. Zoöl. Soc. London, p. 287.

Dipsadomorphus viridis Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 411, figs. 3–4.

Dipsadomorphus brevirostris Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 411, figs. 5–6.

Two specimens of this species were secured by the Congo Expedition: A. M. N. H. No. 12212 (August 1910), Medje; 12213 (July 1913), Nala.

The species evidently ranges throughout the forest, and is obviously adapted to arboreal life. The types came from localities on the Congo close to Stanleyville.

This species is readily distinguished by the great elongation of the body, with small head and bulging eyes, and the loreal entering the eye below the single preocular. Both specimens agree with the description and figure of Boulenger, but have an entire anal plate. Müller (1910, p.

605) has studied the variation in this species in a Cameroon series, and it is evident that the divided anal of the types is abnormal. Nevertheless, its occurrence in occasional specimens makes it impossible to divide the genus on the basis of this character, as Barbour has done (1914, Proc. New England Zoöl. Club, IV, p. 95). The temporals are 1–1–2 in one specimen, 2–1–2 in the other. Labials 8 above, 9 below in one, 10 in the other.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12212	12213
Sex	♂	♀
Length	830	1040 mm.
Tail	195	261 mm.
Tail/Length	0.23	0.25
Ventral Plates	217	207
Subcaudals	102	105
Dorsal Scales	17–17–13	17–17–13

DROMOPHIS Peters

Dromophis lineatus (Duméril and Bibron)

Plate XIII

Dryophylax lineatus DUMÉRIL AND BIBRON, 1864, 'Erpétol. Gén.,' VII, p. 1124.

Dromophis lineatus BOULENGER, 1895, Ann. Mag. Nat. Hist., (6) XVI, p. 33; 1896, 'Cat. Snakes,' III, p. 149; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 279. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. BOULENGER, 1905, Ann. Mus. Stor. Nat., Genova, (3) II, p. 214. WERNER, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1877. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, IV, p. 217; 1910, V, p. 64. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 166. STERNFELD AND NIEDEN, 1911, Mitt. Zool. Mus. Berlin, V, p. 385. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 212, 630, 653. CHABANAUD, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 376; 1917, XXIII, p. 12. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 289. CHABANAUD, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 470.

A single specimen, A. M. N. H. No. 12261, was taken at Faradje, September 1912.

Dromophis lineatus was collected in the Lado by Emin Pasha. It ranges throughout the Sudan, extending east and south to Zanzibar and Nyassaland.

The specimen, a male, measures 890 mm., tail 267 mm., .30 of the total length. Ventral plates 153, subcaudals 94, dorsal scales 17–17–13. One preocular and two postoculars. Temporals 1–1–3 and 1–2–3. Labials 8 above and 9 below.

The coloration is olive-brown above, with a narrow vertebral and two lateral stripes of dull yellow, obscure anteriorly. Venter uniform bluish green, chin and throat white, dark spotted.

PSAMMOPHIS Boie

Psammophis sibilans (Linnæus)

Coluber sibilans LINNÆUS, 1766, 'Syst. Nat.,' 12th Ed., I, p. 383.

Psammophis sibilans BOIE, 1827, 'Isis,' p. 547. BOULENGER, 1896, 'Cat. Snakes,' III, p. 161; Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 545; (2) XVII, pp. 13, 21. BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, pp. 78, 93, 113, 177. PERACCA, 1896, Boll. Mus. Torino, XI, No. 255, p. 2. BOULENGER, 1897, Proc. Zoöl. Soc. London, p. 801; Ann. Mag. Nat. Hist., (6) XIX, p. 279. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. MEEK, 1897, Publ. Field Mus. Zoöl., I, p. 179. PERACCA, 1897, Boll. Mus. Torino, XII, Nos. 273 and 304. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 82. WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 400. ANDERSON, 1898, 'Zoöl. Egypt,' I, p. 302, Pl. XLIII, text fig. 12. MOCQUARD, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219. BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 454. FLOWER, 1900, Proc. Zoöl. Soc. London, p. 968. BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 447; Proc. Zoöl. Soc. London, II, p. 18. LAMPE, 1902, Jahrb. Nassau. Ver. Naturk., LV, p. 34. MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, pp. 406, 415. SCHENKEL, 1902, Verh. Naturf. Ges. Basel, XIII, p. 172. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 335, 338, 340, 345. BOULENGER, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 214; Ann. Mag. Nat. Hist., (7) XVI, p. 113; Proc. Zoöl. Soc. London, p. 255. FERREIRA, 1905, Jorn. Sci. Lisboa, (2) VII, p. 116. JOHNSTON, 1906, 'Liberia,' II, p. 832. BOULENGER, 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, part 3, No. 12, p. 11; Proc. Zoöl. Soc. London, p. 487. ROUX, 1907, Rev. Suisse Zool., XV, p. 77. WERNER, 1907, Sitzber Akad. Wiss. (math.-natur.), Wien, CXVI, part 2, p. 1879. BOULENGER, 1908, Ann. Natal Mus., I, p. 229. GOUGH, 1908, Ann. Transvaal Mus., I, p. 29. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 412; IV, pp. 218, 241, 244, 246. WERNER, 1908, 'Rept. Wellcome Res. Lab. Khartoum,' p. 171. BOULENGER, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, pp. 193, 303. CHUBB, 1909, Proc. Zoöl. Soc. London, p. 596. GENDRE, 1909, Extr. C. R. Soc. Linn. Bordeaux, p. cvi. BOULENGER, 1910, Ann. S. African Mus., V, p. 514. MEEK, 1910, Publ. Field Mus. Zoöl., VII, p. 405. ROUX, 1910, Rev. Suisse Zool., XVIII, p. 99. STERNFELD, 1910, Mitt. Zool. Mus. Berlin, V, p. 166. LÖNNBERG, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 23. STERNFELD, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 250. HEWITT, 1912, Rec. Albany Mus., II, p. 272. PERACCA, 1912, Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 6. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. BOETTGER, 1913, 'Wiss. Ergeb. Reise Ostafrika, Voeltzkow,' III, pp. 353, 361. KLAPTOCZ, 1913, Zool. Jahrb. (Syst.), XXXIV, p. 286. LÖNNBERG AND ANDERSSON, 1913, Ark. Zool., Stockholm, VIII, No. 20, p. 4. BOULENGER, 1913, Proc. Zoöl. Soc. London, pp. 213, 631, 653. CHABANAUD, 1916, Bull. Mus. Hist. Nat., Paris, XXII, pp. 75, 377; 1917, XXIII, p. 12; 1918, XXIV, p. 165. LOVERIDGE, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 328. BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 26. CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, XXV, p. 568. WERNER, 1919, Denkschr. Akad. Wiss. Wien, math.-natur. Kl., XLVI, p. 503. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 290. CHABANAUD, 1920, Bull. Mus. Hist. Nat., Paris, XXVI, pp. 462, 464. ANGEL, 1921, Bull. Mus.

Hist. Nat., Paris. XXVII, p. 141. CHABANAUD, 1921, Bull. Études Hist. Sci. Afrique Occ. Française, p. 470.

Thirteen specimens of *Psammophis sibilans* were collected in the Uele District and another from Beni (also in the savannah, near the Ruwenzori) was presented to the expedition by Dr. J. Bequaert: A. M. N. H. No. 12271 (1914), Beni; 12262, 12267, 12268–69 (February, October and January 1912), Faradje; 12263–66 (June 1912), Garamba; 12257–59, 12260 (November and December 1910), 12270 (June 1913), Niangara.

The largest male measures 1500 mm., the largest female 1100 mm., and a specimen represented only by a head measured 1720 mm. when caught. The tail is frequently injured in this species, .27–.29 of the total in nine specimens. The ventral plates range from 170–181, mean 178, the subcaudals from 87–101, mean 96. Dorsal scales 17–17–13. One preocular and two postoculars. Temporals normally 2–2–3, somewhat variable, 3–3–3 in one specimen, 1–2 in another. Upper labials 8, lower 9–11, usually 10.

The specimens from the Uele represent the color form "F" of Boulenger, uniform olive-brown above, extending to the ends of the ventrals, yellowish below, with a well-marked black line on each side of the venter.

The specimen from Beni possibly represents the color form "B," but has no trace of the head markings of the typical *sibilans*. The color is olive-brown above, extending to the lower third of the first scale row; a broad white line outlined with black, on the third and fourth scale rows, beginning some distance behind the head, extends to the tip of the tail. Venter bluish on the median two-thirds, outlined with a fairly well-marked darker line, outside of which the ventrals and the lower third of the first scale row are pure white.

The species of *Psammophis* are of exceptional systematic interest and offer fascinating problems in variation and distribution for a revisor of the genus. It seems probable that *P. sibilans* will be found to have several well-defined subspecies when the variation can be critically compared in the several faunal areas in which it occurs.

THELOTORNIS Smith

Thelotornis kirtlandii (Hallowell)

Plate XIV

Leptophis kirtlandii HALLOWELL, 1844, Proc. Acad. Nat. Sci., Phila., p. 62.

Thelotornis kirtlandii PETER, 1882, 'Reise nach Mossambique,' III, p. 131, Pl. XIX, fig. 2. BOULENGER, 1896, 'Cat. Snakes,' III, p. 185; 1897, Proc. Zoöl. Soc. London, p. 801; Ann. Mag. Nat. Hist., (6) XIX, p. 279. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 83. Mocquard, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 140. Tornier, 1901, Zool. Anz., XXIV, p. 64. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 447. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 345. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 214. Johnston, 1906, 'Liberia,' II, p. 832. Boulenger, 1907, Proc. Zoöl. Soc. London, p. 487; Mem. Proc. Manchester Lit. Philos. Soc., LI, No. 12, p. 11; 1908, Ann. Natal Mus., I, p. 229. Gough, 1908, Ann. Transvaal Mus., I, p. 32. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 413; IV, p. 219. Chubb, 1909, Proc. Zoöl. Soc. London, p. 596. Boulenger, 1910, Ann. S. African Mus., V, p. 515. Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 16. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 607. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 442. Peracca, 1910, Boll. Mus. Torino, XXV, No. 624, p. 4. Sternfeld, 1910, Mitt. Zool. Mus. Berlin, V, p. 56; 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 251. Peracca, 1912, Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 6. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 614. Lönnberg and Andersson, 1913, Ark. Zool., Stockholm, VIII, No. 20, p. 4. Müller, 1913, Zool. Anz., XLI, p. 234. Werner, 1913, in Brehm's 'Tierleben,' 4th Ed., V, p. 402. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 213, 631, 654. Breijer, 1915, Ann. Transvaal Mus., V, p. 113. Loveridge, 1918, Journ. E. Africa Uganda Nat. Hist. Soc. No. 13, p. 327. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 26; 1920, Proc. Zoöl. Soc. London, p. 290; Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 471.

Thelotornis kirtlandii is represented in the collection by fifteen specimens: A. M. N. H. No. 12282 (September 1913), Akenge; 12272–12279 (November 1910), Niangara; 12283–85 (November 1913), Niapu; 12280–81 (August 1913), Poko; 12286 (tag corroded), Belgian Congo.

The range of this species represents a type of distribution very distinct from that of its relative *Dispholidus typus*, although the ranges of both have been correctly enough referred to as "Tropical and South Africa." It is abundant in various parts of the Rain Forest of Gaboon and Cameroon as well as the Ituri but, instead of being confined to the forest or to the neighborhood of the forest, it has an even wider range in the Savannah Province. It extends roughly from Togo to Uganda, from the Juba River to Natal, and from Northern Rhodesia to Angola and even northern Southwest Africa. The southward extension of the range to Natal (and not to western South Africa) is a characteristic feature of the distribution of many widely ranging species, not only of animals but of plants. Hewitt (1910, Ann. Transvaal Mus., II, p. 56) has called attention to this feature of South African distribution. *Thelotornis* represents an extreme specialization for the arboreal habitat, and it is known to feed on birds and tree lizards; from this fact the assumption is logical that it is primarily a forest species which has spread outside of the forest limits after reaching its specific distinctness. An arboreal form originating in the savannah would be expected to become still more specialized for the arboreal habitat if it entered the Rain Forest, while the reverse is obviously not the case (irreversibility of evolution). The specimens from South and East Africa probably represent a valid subspecies, *Thelotornis kirtlandii capensis* (Smith) characterized by the uniform presence of black head markings.

The depressed and flat head, with the canthus rostralis distinctly projecting, forming a shallow loreal groove, is very characteristic, distinguishing the species at once from all other African snakes. The largest male in the present series measures 1330 mm., the largest female 1445 mm., the tail occupying .33–.37 of the total, but frequently injured. The ventral plates range from 173–189, slightly higher in females, mean 178. Subcaudals 150–157 in males, 140–154 in females. Dorsal scales 19–19–13, frequently 21 anteriorly. One preocular and three postoculars, temporals 1–2 in every specimen. Labials 8–9 above, 9–11 below. There are usually three enlarged occipitals behind the parietals, five in one specimen.

The coloration is uniform in the series but difficult to describe: a very fine mixture of greens, browns, grays, and pink, the latter color predominating on the venter, the comparison made in the field notes being "mouldy." The top of the head is uniform green in life, brownish in alcohol. The neck is crossbarred with black, much more distinct when the neck is distended.

The distension of the neck in this species has been excellently described in vivarium specimens by Müller (1910, p. 607), who regards it as a warning or frightening adaptation of special interest since the remainder of the body offers an exceptionally good example of protective coloration.

DISPHOLIDUS Duvernoy

Dispholidus typus (Smith)

Plate XV

Bucephalus typus SMITH, 1829, Zoöl. Journ., IV, p. 441.

Dispholidus typus BOULENGER, 1896, 'Cat. Snakes,' III, p. 187; Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 553; 1897, Proc. Zoöl. Soc. London, p. 801. JOHNSTON, 1897, 'British Central Africa,' p. 361*a*. BOULENGER, 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 721. FERREIRA, 1898, Jorn. Sci. Lisboa, (2) V, p. 244. BOULENGER, 1902, Proc. Zoöl. Soc. London, II, p. 18. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 34. FERREIRA, 1903, Jorn. Sci. Lisboa, (2) VII, p. 12. GOUGH, 1903, Zool. Jahrb. (Syst.), XVII, p. 468. BOULENGER, 1905, Proc. Zoöl. Soc. London, p. 255; Ann. Mag. Nat. Hist., (7) XVI, p. 113.

Boulenger, 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, No. 12, p. 12. Roux, 1907, Rev. Suisse Zool., XV, p. 77; Zool. Jahrb. (Syst.), XXV, p. 739. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), CXVI, part 2, p. 1880. Boulenger, 1908, Ann. Natal Mus., I, p. 230. Gough, 1908, Ann. Transvaal Mus., I, p. 32. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, IV, p. 219. Chubb, 1909, Proc. Zoöl. Soc. London, p. 596. Fitzsimmons, 1909, Ann. Mag. Nat. Hist., (8) III, p. 271. Boulenger, 1910, Ann. S. African Mus., V, p. 515. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 442. Sternfeld, 1910, Mitt. Zool. Mus. Berlin, V, p. 57. Werner, 1910, Denkschr. Med. Naturw. Ges. Jena, XVI, p. 363. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 166. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 274. Boettger, 1913, 'Wiss. Ergeb. Reise Ostafrika, Voeltzkow,' III, p. 362. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 164. Lönnberg and Andersson, 1913, Ark. Zool., Stockholm, VIII, No. 20, p. 5. Werner, 1913, in Brehm's 'Tierleben,' 4th Ed., V, p. 402, fig. 00. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 213, 631, 654. Chabanaud, 1913, Bull. Mus. Hist. Nat., Paris, XXII, p. 377. Loveridge, 1916, Journ. E. Africa Uganda Nat. Hist. Soc., V, No. 10, p. 80; 1918, No. 13, p. 325. Boulenger, 1920, Proc. Zoöl. Soc. London, p. 290. Chabanaud, 1920, Bull. Mus. Hist. Nat., Paris, XXVI, p. 464; 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 471.

Dispholidus typus viridis Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 214.

Dispholidus typus belli Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 377.

Eight specimens of this widely distributed species were collected: A. M. N. H. Nos. 12494, 12495–96 (February and March 1911), 12498 (December 1912), Faradje; 12497 (July 1912), Garamba; 12493 (November 1910), 12499 (June 1913), Niangara; 12509 (tag corroded), Belgian Congo.

Dispholidus typus evidently does not occur in the Rain Forest, though reaching its borders. It is one of the most widely distributed African snakes, ranging from Senegal to Eritrea, and reaching even the Cape Peninsula in South Africa. In Angola it is recorded from San Salvador and Duque de Bragança, well to the north, so that its range completely circumscribes the Rain Forest.

The form of the head is characteristic, but resembles that of several other large-eyed snakes, the diameter of the eye nearly or quite equalling the length of the snout. The largest male measures 1221 mm., the largest female 1292 mm. The tail length varies from .26–.27 of the total in males, .24–.26 in females. Ventral plates 181–185 in males, 186–191 in females; subcaudals 108–121, 101–107, respectively. The dorsal scale count is 23–19–11, occasionally 25–21–13. One preocular, and three postoculars, two postoculars in one specimen, 2–3 in another. Temporals uniformly 1–2. Labials seven above, 9–12 below. Enlarged occipitals very variable, 1–3.

Three types of coloration are represented in the present small series. Two adult specimens are uniform brown, two are uniform green, and two are greenish or brownish, the scales black-edged and the head shields heavily vermiculated with black. The spotted specimens have a shorter snout and higher loreal, but are otherwise indistinguishable from the uniformly colored forms. The two small specimens are of especial interest, for they evidently are the juvenile coloration of the brown form. The upper surface of the head is uniform brown; the dorsal scales are spotted with white and edged at the base with black; the tips of the ventrals are black; there is a series of more or less vertical black spots on the sides of the neck, and a concealed black spot between the posterior chin shields. On distension of the neck these black marks become much more vivid, since the color extends to the skin between the scales, as in *Thelotornis*. In the adult brown specimens the black neck marks are still visible, though ill-defined, and the black spot between the chin shields is also present. The species also distends its neck when excited or disturbed, but the distension is cylindrical instead of laterally compressed, as in *Thelotornis* (Werner, 1913, p. 402). The correlation of a vivid neck pattern, in this species as well as in *Thelotornis*, with the habit of distending the neck when disturbed, adds to the evidence that it is a "frightening" coloration (distinguished from "warning" coloration). The distension of the neck in various forms, with various structural modifications, associated with a frightening or warning posture, is an extraordinarily widespread characteristic of snakes.[1]

CALAMELAPS Günther

Calamelaps unicolor (Reinhardt)

Calamaria unicolor REINHARDT, 1843, Danske Vidensk. Selsk. Afh., X, p. 236, Pl. I, figs. 1–3.

Calamelaps unicolor GÜNTHER, 1866, Ann. Mag. Nat. Hist., (3) XVIII, p. 25. BOULENGER, 1896, 'Cat. Snakes,' III, p. 245. TORNIER, 1901, Zool. Jahrb. (Syst.), XIV, p. 85. BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 447. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, IV, p. 219. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 166; 1915, Proc. Zoöl. Soc. London, p. 632; 1920, p. 291.

A single female specimen of this species, A. M. N. H. No. 12445, was collected at Faradje, April 1911.

Well known from Togo and Uganda, the occurrence of *Calamelaps unicolor* at Faradje establishes the fact of a Sudanese distribution for this species. It is another illustration of the obvious rule that members of the Togo-Niger fauna have reached Uganda via the plains, while species from the Gaboon-Cameroon area reaching Uganda have spread through the forest.

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[1] See Noble, 1921, Natural History, XXI, pp. 166-171.

The specimen agrees excellently with Boulenger's description, but is of extraordinary size, measuring 722 mm. The tail measures 50 mm., .07 of the total. Ventral plates, 202; subcaudals, 23; dorsal scale count, 15–17–17, No pre- or postocular, the supraocular bordering the eye behind. Temporal widely separated from the eye by a suture of the fifth labial and parietal. Labials, 6 above and 7 below.

Uniformly colored above and below, a very dark grayish brown.

This species is extraordinarily like *Atractaspis*, and it was supposed by the collectors that the fangs had been removed by the natives who brought the specimen.

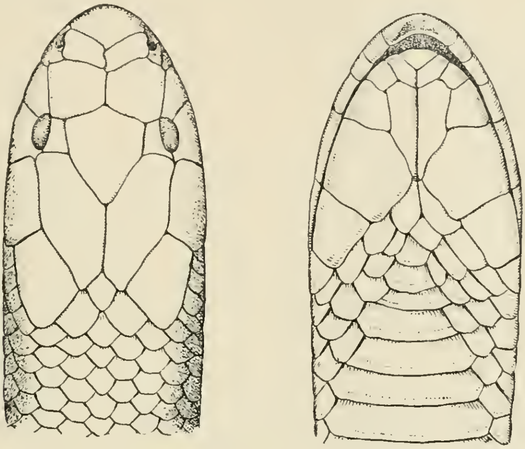


Fig. 12. Dorsal and ventral views of head of *Calamelaps niangaræ*, new species, (12455, type, × 2).

Calamelaps niangaræ, new species

A smaller specimen of *Calamelaps* in the collection, A. M. N. H. No. 12453, taken at Niangara, November 1910, was at first identified with *C. feæ* Boulenger, from the Rio Cassine in Portuguese Guinea. On closer examination it appears that the new specimen is almost exactly intermediate between *C. unicolor* and *C. feæ* and, as comparison with the specimen of *C. unicolor* above described does not warrant the assumption that they are the same species, it seems best to describe the new form separately.

DIAGNOSTIC CHARACTERS

Habitus more slender than in *Calamelaps unicolor* with a smaller head, a more pointed snout and a much longer tail; the prefrontals longer than the internasals, but their suture shorter than that between the internasals; supraoculars very small; 6 upper labials, the fifth broadly in contact with the parietal. Ventral plates 182, subcaudals 34, dorsal scales in 17 rows.

DETAILED DESCRIPTION

Type.—A. M. N. H. No. 12453, ♂.

Habitus rather slender, head not at all distinct from neck, tail short and obtuse, but decidedly longer than in *Calamelaps feæ*.

Rostral large, broader than deep, the part visible from above shorter than its distance from the frontal, beneath with a deeply impressed groove. The rostral extends relatively further forward beyond the mental than in *C. feæ*. Frontal six-sided, longer than its distance from the snout. Internasals much broader than long, shorter than the prefrontals, but their suture longer than that between the prefrontals. Supraocular very small, probably a single postocular. Six upper labials, the fifth largest and forming a suture with the parietal. Seven lower labials, the first pair forming a suture behind the mental, fourth very large and meeting its fellow behind the single pair of chin shields. Dorsal scales 15–17–17; ventral plates 182; anal plate divided; subcaudals 34, in two rows.

Total length 414 mm., tail 48 mm., .12 of the total.

Uniform blackish brown, the scales very narrowly light-edged and distinct, the ventrals more distinctly light-edged.

The specimen has been slightly damaged by ants, so that the nasals and the edges of the shields surrounding the eyes are destroyed.

From *Calamelaps unicolor* it is distinguished by the more slender habitus, the much smaller supraoculars, the smaller prefrontals, and especially the short suture between them. In these characters it agrees with *C. feæ*. It is distinguished from *C. feæ* in having six upper labials, the fifth in contact with the parietal; in the meeting of the fourth lower labials behind the chin shields; in the 17 dorsal scale rows (as in *C. unicolor*); and in the lower number of ventrals and higher number of subcaudals, corresponding to the longer tail. This last character might be considered a sex variation were not the type of *feæ* also a male.

MIODON Duméril

Miodon gabonensis (Duméril)

Elapomorphus gabonensis A. DUMÉRIL, 1856, Rev. Mag. Zool., (2) VII, p. 468.

Miodon gabonensis BOULENGER, 1896, 'Cat. Snakes,' III, p. 252. WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 450; 1899, XLIX, p. 140. ANDERSSON, 1902, Bihang Svenska Vetensk.-Akad. Handl., XXVII, part 4, No. 5, p. 23. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 413; IV, p. 219. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 609. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 215, 633; 1919, Rev. Zool. Africaine, VII, p. 26; 1920, Proc. Zoöl. Soc. London, p. 291.

Two specimens from Medje, A. M. N. H. No. 12449 (March 1914) and 12450 (April 1914), were collected.

Miodon gabonensis is known from the west African forest, and Boulenger (1915, p. 633) records its occurrence in East Africa.

The specimens correspond excellently with Boulenger's description, but represent the uniformly colored phase, without longitudinal lines. One preocular, two postoculars; temporals 1–1, subequal; labials 7 above and below, the third and fourth entering the eye.

The dorsal color is dark grayish brown, darker posteriorly, the head gray. The two scale rows next the ventrals are lighter in color and more reddish brown. The venter is uniform light yellow, with no dark color on the end of the ventrals, as in *M. collaris.* The yellow of the venter extends onto the sides of the neck, suggesting an approach to the nuchal collar often present in species of this genus.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12449	22450
Sex	♂	♀
Length	722	652 mm.
Tail	39	27 mm.
Tail/Length	0.05	0.04
Ventral Plates	228	252
Subcaudals	20	18
Dorsal Scales	15–15–15	15–15–15

Miodon unicolor, new species

A single specimen from Poko, A. M. N. H. No. 12454, taken in August 1913, represents a distinct species of *Miodon.*

DIAGNOSTIC CHARACTERS

Habitus, dentition, and arrangement of head shields of *Miodon.* Rostral deeper in proportion to width than in *M. gabonensis.* Diameter of eye equal to half its distance from the labial border. Seventh upper labial highest, forming a suture with the parietal behind the first temporal. Color uniform bluish gray above and below, the ventral plates narrowly edged with white.

DETAILED DESCRIPTION

Type.—A. M. N. H. No. 12454, ♂.

Head not at all distinct from neck, body cylindrical, tail very short, ending in a large spinous scale; head narrower and less depressed than in *Miodon gabonensis.*

Rostral four-fifths as deep as broad, visible from above. Nostril in the anterior half of a divided nasal, directed backwards. Internasals longer than broad, shorter than the prefrontals, which are wider than long. No loreal. Frontal small, longer than the prefrontals, a little more than half the length of the parietals, half as broad as the interorbital width. Parietals large, as wide behind as in front, in contact with the upper postocular in front and the seventh labial behind, emarginate on their lateral border. One pre- and two postoculars. A large temporal, three-fourths as long as the parietal. Seven upper labials, the last highest and reaching the parietal behind the temporal. Seven lower labials, the first pair forming a suture behind the mental, the fifth largest. Two pairs of chin shields, the anterior larger.

Length 563 mm., tail length 40 mm., .07 of the total. Ventral plates 202, subcaudals 23; dorsal scales 15–15–15.

Color bluish gray, each scale finely outlined with darker color. Ventrals of the same shade, their posterior edges mottled with white, more heavily anteriorly, where the white extends the full width of the venter.

The cutting off of the temporal behind by a parietal-labial suture may prove to be an individual anomaly by fusion of the second temporal with the parietal. In this event, however, the height of the seventh labial and the small size of the posterior temporal would still be distinctive of the species.

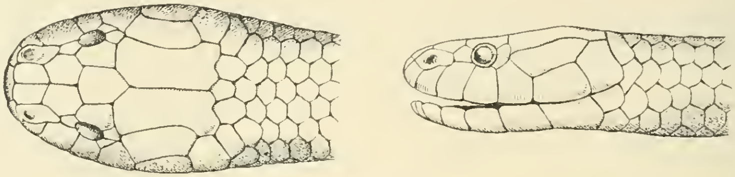


Fig. 13. Dorsal and lateral views of head of *Miodon unicolor*, new species, (12454, type, × 2).

Miodon collaris (Peters)

Microsoma collare Peters, 1887, Sitzber. Ges. Naturf. Freunde, Berlin, p. 148.

Miodon collaris Boulenger, 1896, 'Cat. Snakes,' III, p. 251. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) X, p. 13. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 454. Gough, 1903, Zool. Jahrb. (Syst.), XVII, p. 468. Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 114. Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 169. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 215; 1920, p. 291.

Six specimens are referred to this species: A. M. N. H. No. 12445 (August 1910), 12451–52 (April 1914), Medje; 12446–46 (November 1913), Niapu.

These specimens correspond in coloration and scale characters with *Miodon collaris* in every respect with the exception of a higher range of ventral plates. The dentition resembles that of *Cynodontophis* Werner (1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 345), but the writer has retained *Miodon* (as currently used) pending a revision of this difficult group. Müller (1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 611) has referred *Cynodontophis æmulans* to *Miodon notatus*, but retains the new genus which has also been recognized by Boulenger (1915, p. 215).

The specimens agree in having one pre- and two postoculars; seven labials above and below, of which the third and fourth upper labials enter the eye; and temporals 1–1, subequal.

The coloration is strikingly like that of *Miodon collaris* figured by Bocage (1895, 'Herpétol. Angola,' Pl. xv, fig. 1). The dorsal scales are a dark grayish brown, slightly reddish on the sides, and the ventrals have a spot of the same color at each end as wide as the adjacent scale. The remainder of the venter is light yellow. A sharply defined collar of the ventral color crosses the neck about four scales behind the parietals, and extends forward on the sides of the head and edges of the parietals. The tip of the chin is black, the tip of the tail yellow.

The black head-pattern is vividly marked in a juvenile specimen. The central portion of the parietals, all of the frontal, and a large central spot on each of the supraoculars and prefrontals is black, sharply outlined against the orange ground color. A black subocular spot on the third and fourth labials, and a small black spot on the mental and each of the first lower labials completes the pattern.

This small specimen, measuring 230 mm., contained a snake 180 mm. in length, its head, unfortunately, digested.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12445	12446	12447	12448	12451	12452
Sex	♂	♀	♀	♀	♀	♂
Length	230	653	602	675	416	535 mm.
Tail	13	33	26	35	21	34 mm.
Tail/Length	0.06	0.05	0.04	0.05	0.05	0.06
Ventral Plates	232	238	235	235	238	227
Subcaudals	20	20	18	19	18	21
Dorsal Scales	15	15	15	15	15	15

ELAPOPS Günther

Elapops modestus Günther

Plate XVII, Figure 2

Elapops modestus GÜNTHER, 1859, Ann. Mag. Nat. Hist., (3) IV, p. 161, Pl. IV. fig C. BOULENGER, 1896, 'Cat. Snakes,' III, p. 262. MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 8. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 141. BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 454. GOUGH, 1903, Zool. Jahrb. (Syst.), XVII, p. 468. BOULENGER, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 217. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, III, p. 414; IV, p. 220. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 615. DESPAX, 1911, in Cottes, 'Mission Cottes au Sud Cameroun,' p. 240. BOULENGER, 1915, Proc. Zoöl. Soc. London, p. 217; 1919, Rev. Zool. Africaine, VII, p. 27; 1920, Proc. Zoöl. Soc. London, p. 293.

Aparallactus boulengeri WERNER, 1896, Verh. Zool.-Bot. Ges. Wien, XLVI, p. 363.

Aparallactus peraffinis, WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 404, Pl. II, fig. 3.

Nineteen specimens from the Rain Forest: A. M. N. H. No. 12528 (May 1914), Avakubi; 12510–17, 12518–25, 12526–27 (April, June and July 1914), Medje.

Elapops modestus is doubtless a forest species, ranging from Liberia and Gaboon to the Ituri.

The present series exhibits a considerable range of variation in dentition, scale characters, and coloration. The preliminary identification was far from satisfactory, as a considerable number of maxillæ were examined before finding grooved teeth, three out of eight specimens had faint grooves while the other five had solid posterior teeth. The specific identification offered still greater difficulties, for the coloration of many specimens is exactly that of *Aparallactus ubangensis* and *A. flavitorques* (Boulenger, 1901, Ann. Mus. Congo, (1) II, p. 11, Pl. IV, figs. 2–3), one of which at least comes from the Rain Forest and specimens of *Elapops modestus* from Cameroon appear to represent a larger form. The feeble enlargement of the posterior teeth and the faintness of the grooves when these are present at all preclude the possibility of identifying them as *Aparallactus*. *Elapops modestus* is not described as collared, but in the present series there is a complete transition from the collared juvenile and half-grown specimens to the uniformly colored adults. The dorsal extension of the rostral, the size of the prefrontals, the size of the eye, the size of the postoculars, and the shape and size of the frontal and parietals are not precisely alike in any two specimens, and it has proved impossible to correlate any group of characters to distinguish any particular group of specimens. The sublabials in contact with the anterior chin shields are 3 in five specimens, 3–4 in two specimens, and 4 in twelve. The upper labials bordering the parietal are the fifth and sixth, but the extent of the suture with the fifth varies greatly. One specimen has the lower postoculars fused with the fourth labial. One specimen has the nasals and preoculars barely in contact at a point.

The largest male measures 442 mm., the largest female 540 mm. The tail length in males is .18.–19 of the total, in females .13–.16. The sexes are sharply distinguished by the number of ventrals, 139–144 in males, 154–164 in females; subcaudals 43–47 in males, 37–44 in females.

Aside from the presence or absence of a light brown nuchal collar already mentioned, the coloration varies in shade of gray, two specimens being much lighter bluish gray, and the venter may be immaculate yellow or heavily mottled with dark gray.

The writer is convinced that the species of *Aparallactus* require revision and, although far from satisfied with the present reference of an apparently heterogeneous series of specimens, it appears undesirable to add to the number of named forms without reference to comparison material and to types.

Elapinæ

Boulengerina Dollo

Boulengerina annulata (Buchholtz and Peters)

Naja annulata Buchholtz and Peters, 1876, Monatsber. Akad. Wiss. Berlin, p. 419. Mocquard, 1887, Bull. Soc. Philom. Paris, (7) XI, p. 84. Bocage, 1895, 'Herpétol. Angola,' p. 137.

Aspidelaps bocagei Sauvage, 1884, Bull. Soc. Zool. France, IX, p. 205, Pl. vi, fig. 2.

Boulengerina annulata Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 14. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 141. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 455, Pl. xxxii. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 347. Boulenger, 1904, Ann. Mag. Nat. Hist., (7) XIV, p. 15. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 415. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 218; 1919, Rev. Zool. Africaine VII, p. 27; 1920, Proc. Zoöl. Soc. London, p. 294.

Boulengerina dybowskyi Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 15. Boulenger, 1904, Ann. Mag. Nat. Hist., (7) XIV, p. 15; 1920, Proc. Zoöl. Soc. London, p. 294.

Five specimens of *Boulengerina* were secured by the Congo Expedition: A. M. N. H. No. 12331 (October 1913), Avakubi; 12393 (March 1914), Medje; 12329 (December 1909), N'Gayu; 12330, 12394 (November 1913), Niapu.

The series is of especial interest in necessitating the reference to synonymy of *B. dybowskyi* Mocquard, which makes its range co-extensive with the eastern division of the Rain Forest, from Cameroon to the Tanganyika. The fact that it is a water snake, confused in the field with the crossbarred *Grayia*, is of interest in connection with its range, which is determined not by the Congo but by the Rain Forest.

The largest specimen, a male, measures 1900 mm. The mean proportion of tail length to total is .20. The scales at mid-body are in 21 rows in three specimens, in 23 in two. The preoculars are 1 on each side, the postoculars 2. The temporals are 1–3 in three specimens, 1–2 in one, and 1–3 on one side and 2–3 on the other in the last. Upper labials 7, lower 8 or 9.

The variation in this small series is obviously sufficient to connect the species *dybowskyi* with *annulata*. The only distinction of *stormsi*, besides a difference in coloration from *annulata*, is in the 21 scale rows instead of 23, and the longer tail. In three of the specimens examined, the temporals are 1–3, a condition not hitherto recorded in *annulata*; but one of the specimens has temporals 1–2, exactly as in Boulenger's figures of this species (1900, Pl. xxxii). The fifth specimen, with the usual temporal configuration of 1–3 on one side, has 2 anterior temporals on the other side followed by 3 in the second row. This is exactly as in

B. dybowskyi, and it is evident that Mocquard's specimen represents a symmetrical variation in this respect. The characters adopted by Boulenger in his key to the genus (1904, p. 15) of the height of the rostral is unfortunate. It is said to be nearly as deep as broad in *annulata* and *stormsi*, much broader than deep in *dybowskyi* and *christyi*; all of the present specimens have a rostral considerably broader than deep, with slight variation, but it is impossible to identify them otherwise than as *annulata*. It appears that by the horizontal division of the normally high sixth supralabial, the change from *annulata* to the *dybowskyi* arrangement of labials is made; and an exact analogue of this variation appears in *Dendraspis jamesonii*, which is described as having the lower anterior temporal usually bordering the lip.

The coloration is very characteristic, and has been excellently figured by Boulenger. In the present series the number of black rings is 22–24, of which the first three or four are not divided into pairs. In all of the specimens the ground color is much darker posteriorly, and in two, the posterior rings are entirely obscured.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12329	12330	12331	12393	12394
Sex	♂	♂	♂		
Length	1385	865	1900	1760	1870 mm.
Tail	275	204	365	360 mm.	
Tail/Length	0.20	0.23	0.19	0.20	
Ventral Plates	204	201	207	201	215
Subcaudals	72	76	71	77	
Dorsal Scales	23–21–17	25–21–17	25–21–17	25–23–16	25–23–17
Temporals	1–3	1–3	1–3	1–2	$\frac{1\text{–}3}{2\text{–}3}$

LIMNONAJA, new genus

Boulengerina christyi Boulenger appears to be so distinct from *Boulengerina annulata* as to warrant the erection of a distinct genus whose characters follow.

Maxillary bone extending forward as far as the palatine, with a pair of large grooved poison fangs, followed by two or three small teeth; anterior mandibular teeth longest; head very distinct from neck; eye small with round pupil; nostril very large, pierced in a single nasal; scales smooth, without pits, in seventeen rows; tail moderate, subcaudals in two rows; posterior half of body and tail strongly compressed; a median row of transversely widened dorsal scales on the compressed part of the body.

TYPE.—*Limnonaja christyi* (Boulenger).

It is distinguished from *Boulengerina* by the widened head, distinct from the neck, the compressed instead of cylindrical body and tail, and the transversely widened dorsal scales. In addition, its coloration is wholly distinct from that of *Boulengerina.*

Limnonaja christyi (Boulenger)

Boulengerina christyi Boulenger, 1904, Ann. Mag. Nat. Hist., (7) XIV, p. 14; 1915, Proc. Zoöl. Soc. London, p. 218.

A single small specimen, A. M. N. H. No. 11902, of this species, comes from Boma, collected in June 1909. It has been known only from the type, collected at Leopoldville.

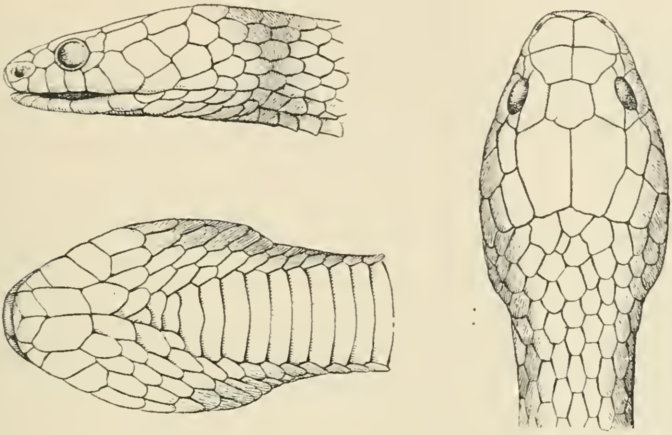


Fig. 14. Dorsal, lateral, and ventral views of head of *Limnonaja christyi* (Boulenger), (11902, × 2).

The juvenile (female ?) specimen measures 474 mm., tail 89 mm., slightly larger than the type. Ventral plates 206, subcaudals 69; dorsal scales 17–17–13; one preocular; two postoculars; temporals 1–3; seven upper labials, the third and fourth entering the eye; eight lower labials, four in contact with the anterior chin shields. The agreement with the type is close in every respect except that there are 1–3 temporals instead of 2–2 or 2–3 and the fourth, fifth and sixth upper labials are in contact with the lower postocular instead of only the fourth and fifth. This is evidently the same variation as occurs in *Boulengerina annulata,* on which *B. dybowskyi* Mocquard was based. Reference to the figure shows how the cutting off of an anterior lower temporal from the sixth upper labial changes the condition in the present specimen to that described in the type.

The coloration is black above and below, the neck with more or less irregular crossbands of yellowish, which become indistinct posteriorly, and disappear entirely beyond the anterior fourth of the body. Throat and chin yellow, head brownish, darker above, lighter on the sides.

The field notes recorded under field number 1 read as follows: "Snake, bought in Boma for 50 cents, June 22, 1909. Evidently a water snake, as it was sold in a bottle of water. Saw a much larger one in the street of Matadi, June 27, at least twice as big as the first" (H. Lang).

NAJA Laurenti

Naja haje (Linnæus)

Coluber haje LINNÆUS, 1764, 'Mus. Adolph. Frid.,' II, p. 46.

Naja haje MERREM, 1820, 'Tent. Syst. Amphib.,' p. 148. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 84. ANDERSON, 1898, Zool. Egypt, I, p. 312, Pl. XLIV. BREIJER, 1915, Ann. Transvaal Mus., V, p. 115.

Naja hajæ WERNER, 1908, 'Rept. Wellcome Res. Lab. Khartoum,' p. 176, Pl. XVII, fig. 1.

Naja haie LÖNNBERG, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 23.

Naia haie BOULENGER, 1896, Cat. Snakes,' III, p. 374. FRANCAVIGLIA, 1896, Boll. Soc. Romana Zool., V, p. 35. BOULENGER, 1897, Ann. Mus. Stor. Nat. Genova, (2) XVII, p. 279; 1902, Proc. Zoöl. Soc. London, II, p. 18; 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 180. WERNER, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, Pl. I, p. 1882. BOULENGER, 1908, Ann. Natal Mus., I, p. 230. GOUGH, 1908, Ann. Transvaal Mus., I, p. 35. CHUBB, 1909, Proc. Zoöl. Soc. London, p. 593. BOULENGER, 1910, Ann. S. African Mus., V, p. 517. HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 164. WERNER, 1913, in Brehm's 'Tierleben,' 4th Ed., V, p. 443. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 636, 655. LOVERIDGE, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 324. WERNER, 1919, Denkschr. Akad. Wiss. Wien, math.-naturw. Kl., XLVI, p. 507. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 294.

A single specimen, A. M. N. H. No. 12326, was taken at Faradje, February 1911.

The occurrence of *Naja haje* in this part of the Sudan is of considerable interest. There is no satisfactory record of this species from Togo or Nigeria or the arid interior of Cameroon, the specimen reported by Bavay (1895, Bull. Soc. Zool. France, XX, p. 210) from Dahomey being probably referrable to *N. nigricollis*, especially as he refers to the spitting habit. The records from Angola and the Congo are still more dubious, as Bocage confuses it with *melanoleuca*. If *Naja haje* does not range through the Sudanese Subprovince, its distribution is a peculiar one, reminiscent to a degree of *Varanus griseus*. The extension south in East Africa to Zululand and west in North Africa to Morocco indicates a relatively recent migration from Lower Egypt as a center; for had it spread from any center in the Savannah Province, it must inevitably have possession of the Sudan. On this hypothesis, Faradje represents a western outpost of its range in the Eastern Sudan.

The specimen, a female, measures 1335 mm., of which the tail occupies 196 mm., .15 of the total. There are 210 ventral plates and 57 subcaudals. The dorsal scale count is 23–21–15. One preocular and four postoculars on each side. Upper labials 7, lower 9.

Naja melanoleuca Hallowell

Plate XVI

Naja haje var. *melanoleuca* HALLOWELL, 1857, Proc. Acad. Nat. Sci., Phila., p. 61.

Naja melanoleuca MATSCHIE, 1893, Mitt. Deutsch. Schutzgeb., VI, p. 214. MOCQUARD, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 14. SHENKEL, 1902, Verh. Naturf. Ges. Basel, XIII, p. 175. WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 347. BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 94. FERREIRA, 1903, Jorn. Sci. Lisboa, (2) VII, p. 12. JOHNSTON, 1906, 'Liberia,' II, p. 808. STERNFELD, 1908, Mitt. Zoöl. Mus. Berlin, III, p. 415; IV, p. 220; 1910, V, p. 64. LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 16. MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 615; 1913, Zool. Anz., XLI, p. 234.

Naja melanoleuca BOULENGER, 1896, 'Cat. Snakes,' III, p. 376; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 280. SJÖSTEDT, 1897, Bihang Svenska Vetensk. Akad. Handl., XXIII, part 4, No. 2, p. 25. WERNER, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 401; 1899, XLIX, p. 141. BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 455; 1902, in Johnston, 'Uganda Protectorate,' p. 447; 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 114; Ann. Mus. Stor. Nat. Genova, (3) II, p. 215; 1909, (3) IV, p. 303; 1911, (3) V, p. 166; 1915, Proc. Zoöl. Soc. London, pp. 219, 636. CHABANAUD, 1915, Bull. Mus. Hist. Nat., Paris, XXII, pp. 75, 318; 1917, XXIII, p. 13; 1918, XXIV, p. 166. LOVERIDGE, 1918, Journ. E. Africa Uganda Nat. Hist. Soc. No. 13, p. 324. BOULENGER, 1919, Rev. Zool. Africaine, VII, p. 27. CHABANAUD, 1919, Bull. Mus. Hist. Nat. Paris, XXV, p. 568. BOULENGER, 1920, Proc. Zoöl. Soc. London, p. 294. CHABANAUD, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 471.

Naja melanoleuca is abundant in the Rain Forest. Thirty-two specimens were collected: A. M. N. H. Nos. 12387–88 (October 1913), Akenge; 12380 (October 1909), 12319 (August 1913), Avakubi; 12366, Bafwabaka; 12314–16, 12369, 12373 (August 1910), 12325 (September 1910), 12323–24, 12370, 12375, 12377–78 (June 1914), Medje; 12376 (July 1913), Nala; 12317 (April 1913), 12379 (November 1910), Niangara; 12320–21, 12367, 12374, 12389–90 (November 1913), 12322, 12371 (December 1913), Niapu; 12318, 12368 (August 1913), Poko; 12365, 12381 (tags corroded), Belgian Congo.

The range of this species is practically co-extensive with that of the Western Forest Province of the Botanical Map. It has been recorded from Nyassaland to Uganda in East Africa, with extreme eastern record from the Kilimandjaro (Lönnberg, 1910, p. 16). Its occurrence outside the continuous forest is probably restricted to forest islands, as at Niangara, Sesse Islands in Victoria Nyanza, and the Kilimandjaro.

The maximum length in fifteen males is 2124 mm., in ten females, 1630 mm. No difference in the proportion of tail length to total can be discerned in the sexes, the range being .16–.19, mean .17. The ventral plates vary from 212–226, mean 218; the subcaudals from 60–71, mean 66. The dorsal scales are 23–29 at the neck, 17–19 at mid-body, and 11–13 posteriorly, the usual count being 25–19–13 (27 is equally common across the neck). The shields of the head are very constant, every specimen showing one pre- and three postoculars; seven upper and eight lower labials, the third and fourth upper labials entering the eye.

The coloration of *Naja melanoleuca* is very distinctive. Adult specimens are entirely black above; posterior three-fourths of the venter, black; throat and sides of the head, light yellow, extending backward on the venter from 6–15 ventral plates, after which, black crossbands appear, increasing in breadth until the venter is entirely black, usually before the fiftieth ventral. In two specimens the venter is mottled with light color to the hundred and first and one hundred and thirty-fifth ventral. In specimens less than a meter in length light crossbands, consisting of rows of white-edge scales, are visible (coloration "B" of Boulenger). In both young and adult specimens the light labials (beginning with the second above and the third below) and the lower temporal are heavily outlined with black, the upper and lower labial sutures corresponding.

Naja nigricollis Reinhardt

Naja nigricollis Reinhardt, 1843, Danske Vidensk. Selsk. Afh., X, p. 269, Pl. iii, figs. 5–7. Bocage, 1896, Jorn. Sci. Lisboa, (2) IV, pp. 79, 95, 113, 178. Peracca, 1896, Boll. Mus. Torino, XI, No. 255, p. 4. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 84. Anderson, 1898, Zool. Egypt, I, p. 322, Pl. xlv. Johnston, 1906, 'Liberia,' II, p. 810. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 415; IV, pp. 220, 241, 244; Werner, 1908, 'Rept. Wellcome Res. Lab. Khartoum,' pp. 171, 176, Pl. xviii, fig. 2. Sternfeld, 1910, Mitt. Zool. Mus. Berlin, V, p. 57. Peracca, 1910, Boll. Mus. Torino, XXV, No. 624, p. 4. Sternfeld, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 251; 1912, 'Wiss. Ergeb. Deutsch. Afrika Exp.,' IV, p. 274.

Naia nigricollis Boulenger, 1896, 'Cat. Snakes,' III, p. 378; Ann. Mus. Stor. Nat. Genova, (2) XVII, pp. 13, 21, 279. Mocquard, 1896, Bull. Mus. Hist. Nat., Paris, II, p. 59. Boulenger, 1897, Proc. Zoöl. Soc. London, p. 801; Ann. Mag. Nat. Hist., (6) XIX, p. 280. Meek, 1897, Publ. Field Mus., Zoöl., I, p. 179. Mocquard, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 148. Boulenger, 1902, Proc. Zoöl. Soc.

London, II, p. 18. Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 416. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 336. Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 114; Ann. Mus. Stor. Nat. Genova, (3) II, p. 215; 1907, Proc. Zoöl. Soc. London, p. 487; Mem. Proc. Manchester Lit. Philos. Soc., LI, No. 12, p. 12. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1883. Boulenger, 1908, Ann. Natal Mus., I, p. 230; 1909, Trans. Zoöl. Soc. London, XIX, p. 246. Chubb, 1909, Proc. Zoöl. Soc. London, p. 597. Boulenger, Ann. S. African Mus., V, p. 518. Werner, 1910, Denschr. Med. Naturw. Ges. Jena, XVI, p. 364. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 166. Curtis, 1911, 'Rept. Wellcome Res. Lab. Khartoum,' p. 195, Pl. xvi. Fraser, idem, p. 201. Peracca, 1912, Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 6. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 165. Methuen and Hewitt, 1914, Ann. Transvaal Mus., IV, p. 144. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 219, 636, 656. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, pp. 75, 381; 1917, XXIII, p. 13. Loveridge, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 321. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 27. Werner, 1919, Denkschr. Akad. Wiss. Wien, math.-natur. Kl., XLVI, p. 507. Boulenger, 1920, Proc. Zoöl. Soc. London, p. 294.

Naia nigricollis var. *pallida* Boulenger, 1896, 'Cat. Snakes,' III, p. 379; 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 721; 1909, (3) IV, p. 311.

Naja nigricollis pallida Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 275.

Naja nigricollis was collected at Faradje, A. M. N. H. No. 12327 (March 1911), and Garamba, No. 12364 (May 1912), with a third specimen, No. 12328, whose tag was corroded, doubtless also from the same region.

Naja nigricollis is the most widespread member of the genus in Africa, its range corresponding exactly with the Savannah Province. It is interesting that it does not occur in the southern parts of Cape Colony, where it is replaced by the very distinct *N. flava*. The present records are the first from the eastern part of the Sudanese Subprovince. It is strange that it was not observed along the Nile by Werner in his Sudan expedition.

MEASUREMENTS AND SCALE CHARACTERS

A. M. N. H. No.	12364	12327	12328	2830
Sex	♀ (juv.)	♀	♂	♂
Length	382	1298	1323	1180 mm
Tail	59	190	212	180
Tail/Length	0.15	0.15	0.16	0.15
Ventral Plates	203	198	194	185
Subcaudals	54	50	57	
Dorsal Scales	21–23–15	21–23–15	21–23–13	21–21–13
Preoculars	2–2	2–2	2–2	2–2
Postoculars	3–3	3–3	3–3	3–3
Supralabials	6–6	6–6	6–6	6–6
Infralabials	9–9	9–9	9–10	8–9

The specimens examined represent the variety *pallida* of Boulenger, but this does not seem to represent a subspecies. A. M. N. H. No. 2830, collected in Kenya Colony by Mr. Herbert Lang on a previous expedition, has been examined in comparison.

Naja goldii Boulenger

Naia goldii Boulenger, 1895, Ann. Mag. Nat. Hist., (6) XVI, p. 33; 1896, 'Cat. Snakes,' III, p. 387, Pl. xx; 1900, Proc. Zoöl. Soc. London, p. 455; 1915, p. 219; 1919, Rev. Zool. Africaine, VII, p. 27; 1920, Proc. Zoöl. Soc. London, p. 296.

Naja goldii Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 417.

Naja yakomæ, Mocquard, 1895, C. R. Congr. Int. Zool., III, p. 233.

Naia guentheri Boulenger, 1896, 'Cat. Snakes,' III, p. 388, Pl. xxi.

Naja guentheri Sternfeld, 1910, Mitt. Zool. Mus. Berlin, IV, p. 220.

Two small specimens of *Naja goldii* were collected in the Ituri Forest, A. M. N. H. No. 12362, (July 1913) from Poko, and No. 12363, (September 1913) from Akenge. It has been recorded from Togo, Cameroon, and the Gaboon region, and Mocquard's specimen from Yakoma on the upper Ubanghi proves the species to be widely distributed in the eastern portion of the Rain Forest.

Both specimens are juvenile, less than half grown. In scale characters they agree excellently with the description of Boulenger (1896, p. 387) and of Mocquard (1895, p. 233). One preocular and three postoculars on each side. Labials, 7 above and 8 below. A rather striking difference in habitus distinguishes this species from all others of the genus, the much greater tail length, .23 of the total in the present specimens, compared with .15 in *Naja nigricollis* and .17 in *N. melanoleuca.*

The coloration has been carefully described by both Boulenger and Mocquard, and is very characteristic. The fact that it appears in the specimen referred to *N. guentheri* by Sternfeld (1910, p. 220) is additional evidence that *guentheri* cannot be distinguished from *goldii.*

Measurements and Scale Characters

A. M. N. H. No.	12362	12363
Sex	♀	♂
Length	608	645
Tail	139	146
Tail/Length	0.23	0.23
Ventral Plates	197	197
Subcaudals	92	88
Dorsal Scales	15–15–11	15–15–11

Dendraspis Schlegel

Dendraspis jamesonii (Traill)

Plate XVII, Figure 1

Elaps jamesonii Traill, 1843, in Schlegel, 'Essai Phys. Serpents,' English Transl. p. 179, Pl. ii, figs. 19 and 20.

Dendraspis jamesonii Boettger, 1888, Ber. Senck. Ges., p. 85. Boulenger, 1896, 'Cat. Snakes,' III, p. 436. Mocquard, 1896, Bull. Mus. Nat. Hist., Paris, II, p. 60. Boulenger, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 280. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 404; 1899, XLIX, p. 141. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 447. Lampe, 1902, Jahrb. Nassau. Ver. Naturk., LV, p. 40. Shenkel, 1902, Verh. Naturf. Ges. Basel, XIII, p. 177. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 347. Gough, 1903, Zool. Jahrb. (Syst.), XVII, p. 467. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 215. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 415; IV, p. 221. Boulenger, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 303. Roux, 1910, Rev. Suisse Zool., XVIII, p. 99. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 275. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 220, 636. Loveridge, 1916, Journ. E. Africa Uganda Nat. Hist. Soc., V, No. 10, p. 80; 1918, No. 13, p. 321. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 27; 1920, Proc. Zoöl. Soc. London, p. 295.

Dendraspis neglectus Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 44.

Dendraspris (misprint) *jamesonii* Müller, 1913, Zool. Anz., XLI, p. 234.

Twenty-seven specimens of *Dendraspis jamesonii* were collected: A. M. N. H. Nos. 12343, 12392 (September 1913), Akenge; 12344–47 (September 1913), Avakubi; 12332–33 (May 1910), 12334 (August 1910), 12382 (October 1910), Medje; 12235–39 (November 1910), 12340 (May 1913), 12341 (June 1913), Niangara; 12348–51, 12386, 12391 (November 1913), 12383–84 (December 1913), Niapu; 12342 (August 1913), Poko.

This species is distributed from French Guinea to the mouth of the Congo, and ranges throughout the Rain Forest to the lake region, where it occurs in the forest islands, as at Niangara in the present collection.

The specimens range in size from 567 mm. to 2470 mm. The largest male measures 2145 mm., the specimen of 2470 mm. being a female. The proportionate tail length is the same in the sexes, .22–.25 of the total, mean .23. The range of variation in number of ventrals is 211–230, mean 221; in number of subcaudals, 102–117, mean 107. The extremes in dorsal scales are 15–15–11 and 19–17–13, usually 17–17–11. The preoculars are 3 on each side in all specimens. The postoculars are four except in two specimens, which have, by fusion of the middle ones, 3 on one side. The enlarged postparietal scales number 3 (between the first temporals) in twenty specimens, 4 in one, and 5 in four. The lower temporal reaches the labial border (counted as the seventh upper labial) in eighteen specimens; in four, a small seventh labial, longer than high, is cut off from the base of the temporal on one side, and in three, this condition is symmetrical. In one specimen the lower anterior temporal is cut off from the postoculars by the sixth labial. Instability of scale arrangement in the temporal area is evidently characteristic of this species.

Viperidæ

Viperinæ

Causus Wagler

Causus rhombeatus (Lichtenstein)

Plate XVIII, Figure 1

Sepedon rhombeatus Lichtenstein, 1823, 'Verz. Doubl. Mus. Berlin,' p. 106.

Causus rhombeatus Boulenger, 1896, 'Cat. Snakes,' III, p. 467, fig. 34. Bocage, 1896, Jorn . Sci. Lisboa, (2) IV, pp. 80, 113. Peracca, 1896, Boll. Mus. Torino, XI, No. 225, p. 4. Boulenger, 1897, Proc. Zoöl. Soc. London, p. 801; Ann. Mag. Nat. Hist., (6) XIX, p. 280. Johnston, 1897, 'British Central Africa,' p. 361*a*. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 86. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 401; 1899, XLIX, p. 142. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 447; 0000, Proc. Zoöl. Soc. London, II, p. 18. Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 416. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 336, 337, 347. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 44. Ferreira, 1903, Jorn. Sci. Lisboa, (2) VII, p. 169. Johnston, 1906, 'Liberia,' II, p. 808. Boulenger, 1907, Proc. Zoöl. Soc. London, p. 487. Roux, 1907, Zool. Jahrb. (Syst.), XXV, p. 740; Rev. Suisse Zool., XV, p. 81. Gough, 1908, Ann. Transvaal Mus., I, p. 38. Johnston, 1908, 'George Grenfell and the Congo,' p. 950. Odhner, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 6. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 416; IV. pp. 221, 245. Werner, 1908, 'Rept. Wellcome Res. Lab. Khartoum,' p. 172, 178, Pl. xvii, fig. 3. Boulenger, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 303. Gendre, 1909, Extr. C. R. Soc. Linn. Bordeaux, p. cv. Boulenger, 1910, Ann. S. African Mus., V, p. 521. Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 17. Peracca, 1910, Boll. Mus. Torino, XXV, No. 624, p. 5. Sternfeld, 1910, Mitt. Zool. Mus. Berlin, V, p. 65. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167. Lönnberg, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 24. Sternfeld and Nieden, 1911, Mitt. Zool. Mus. Berlin, V, p. 385. Fitzsimons, 1912, 'Snakes of South Africa,' p. 233. Peracca, 1912, Ann. Mus. Zool. Napoli, (2) III, No. 25, p. 6. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 276. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 165. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 220, 637, 657. Chabanaud, 1916, Bull. Mus. Nat. Hist., Paris, XXII, pp. 76, 382; XXIII, p. 13; 1918, XXIV, p. 166. Loveridge, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 317. Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, XXV, p. 568. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 28; 1920, Proc. Zoöl. Soc. London, p. 295. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 472.

Causus rhombeatus bilineatus Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 114.

Causus rhombeatus tæniata Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 276.

Thirty-eight specimens of *Causus rhombeatus* were collected as follows: A. M. N. H. Nos. 11744–45, 11746–47 (February and April 1911) are from Faradje; 11724 (July 1910), Irebu; 11735–41, 11743 (November 1910), 11953–54 (May and June 1913), Niangara; 11755–56, 11757–59 (July and August 1913), Poko; 11734 (October 1910), Rungu; 11725–33 (August 1909), 11760–61 (April 1915), Stanleyville; 11762 (June 1915), Zambi.

Specimens from Natal and Matabeleland have also been examined.

This species is one of the most widely distributed of African snakes, occurring over the whole of Africa south of the Sahara, and it is in many places the most abundant form. Its range does not appear to be influenced appreciably by the Rain Forest, although it is probably less abundant inside the forest boundary. The distribution in the Ituri Region is peculiar in that it is recorded only from Stanleyville within the forest, where eleven specimens were taken, although it was taken at four localities outside the forest; and *Causus lichtensteinii*, characteristic of the forest, was not collected at Stanleyville; the suggestion being that the two species are more or less exclusive, and that *C. rhombeatus* occurs only in colonies inside the forest limits, offering an interesting question for further investigation. The number of specimens from the Sudanese localities does not sufficiently emphasize its abundance, for numbers of damaged specimens were rejected. *C. rhombeatus* was not recorded from the Sudan by Werner's expedition collecting in the Lade to the northeast of the area reached by Messrs. Lang and Chapin.

Comparison of the Stanleyville specimens with those from the open country to the north fails to discover any appreciable difference. The extremes in length are 149 mm. and 605 mm. The tail length varies from .06 to .10 of the total. The ventrals number from 131 to 152, the subcaudals in the male from 20 to 24, in the female from 16 to 23. The subcaudals are all divided except in two specimens, one of which has the last eight entire, the other the first seven. The most frequent dorsal scale count is 19–19–12, the lowest 17–17–11, the highest 20–20–14, an even number of scale rows being rather frequent. The scales of the ocular ring, without the supraocular, number from 4 to 7, usually 5; the temporals, normally 2–3, are 3–3 in one case, 2–4 in several. The loreal is normally a single shield; one specimen has loreals 1–2, three have 2–2, one has 2–4, and two have 3–3, unsymmetrical variation in this character being rare. The upper labials are uniformly 6, or, if a small shield just touching the labial border behind be counted, 7.

The coloration is fairly uniform. In life it is "pinkish or reddish brown, with dark brown dorsal markings; chin, pinkish white, throat yellow, remainder of venter pinkish white with a metallic iridescence of blue and purple" (H. Lang). All of the specimens show a median dark line on the upper side of the tail. In many this can be seen to be the continuation of a dorsal band covering at its widest point about 9 middle scale rows (coinciding with the keeled and less obliquely placed scales). This band is rarely distinct on the anterior half of the body, while it is plainly visible in most specimens on the posterior half. The color might be said to consist of three shades of brown, the lighter ground color on the sides, the darker dorsal band, and the still darker dorsal spots on the dorsal band. The subtriangular dorsal spots have their apex directed backward, and the lateral corners more or less continuous with irregular transverse groups of small dark spots on the sides, which usually cover only the upper half of a scale. The number of dorsal spots is fairly constant, 28–30 to the anus, with occasionally a few less due to irregular spacing. The arrow-head-shaped mark on the head and nape is extremely constant, its tip on the frontal. In four of the thirty-eight specimens the dorsal spots are outlined with white dots, a character which does not appear to be related to age or sex.

A single specimen, No. 11741, the largest in the series, has much larger and hence fewer dorsal spots; has the labials sharply outlined with black, instead of shaked; has the triangular head mark truncate in front, with a transverse mark in front of it, and another on the prefrontals has the ventrals strongly dark-edged; and has an unusually long tail. This specimen probably represents an extreme of individual variation in the Sudanese specimens. In specimens from Natal, in The American Museum of Natural History, the labials are always black-edged, and in two the venter is entirely dark on its middle half. These also lack the dorsal band, a row of narrow elongate spots taking the place of the line on the tail in the northern specimens.

The food of this species appears to consist of frogs and toads, two of the series under discussion having swallowed frogs and one a toad, while frequent mention of the frog-eating habit is to be found in the literature. Fitzsimons (1912, p. 233) speaks of the abundance of night adders in houses and woodsheds in search of mice. Specimens in captivity, however, were fed upon frogs and toads.

"Common along roads about Niangara; ten specimens were rejected as too badly damaged for preservation. Common near Faradje. Said to be abundant in gardens at Irebu" (H. Lang).

One specimen was found to be badly infested with ticks.

Causus lichtenstenii (Jan)

Plate XIX

Aspidelaps lichtensteinii Jan, 1859, Rev. Mag. Zool., p. 511.

Causus lichtensteinii Boulenger, 1896, 'Cat. Snakes,' III, p. 470; Werner, 1899, Ver. Zool. Bot. Ges. Wien, XLIX, p. 142. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 216. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 416; IV, p. 245. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 615. Peracca, 1910, in 'Il Ruwenzori,' p. 9. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 277. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 221, 637; 1919, Rev. Zool. Africaine, VII, p. 28; 1920, Proc. Zoöl. Soc. London, p. 296.

Represented in the collection by twenty-seven specimens: A. M. N. H. No. 11767 (September 1913) is from Akenge; 11763 (February 1914), 11764 (October 1909), Avakubi; 11773–79, 11780–88 (April and June 1914), Medje; 11765–66 (December 1909), N'Gayu; 11768–69, 11770–72 (November and December 1913), Niapu.

Causus lichtensteinii (Jan) is the most distinct of the four members of the genus, and is confined to the Rain Forest, while *C. resimus* and *C. defilippi* are found in the Savannah Province, and *C. rhombeatus* in both Savannah and Forest.

This species is one of the least variable of snakes, certain characters being almost absolutely stable. The greatest length observed is 572 mm. The proportionate tail length varies from .08 to .10 in the male (average .090), and from .07 to .08 in the female (average .074). The ventrals number from 133 to 149, the subcaudals in the male from 18 to 22, in the female from 17 to 19. The normal dorsal scale count is 15–15–11, and this is deviated from in only four specimens of the twenty-seven, and in these only near the base of the tail, where three of them have 10 scales and the other 9. The labials are constantly 6 above and 9 below. The oculars are usually 6, 5 in three specimens, and 7 in one. The temporals are in every specimen 2–3, the loreals 1–1 in all except one specimen, which has 2 on one side. The first and second upper temporals are about as long together as the first lower, while in *Causus rhombeatus* the first upper temporal is nearly as long as the lower.

Müller (1910, p. 616) has described the coloration in this species for both adult and juvenile stages. The narrow dark chevrons described by Boulenger as pointing forward and by Müller as directed backward are in most cases indistinct. In one or two specimens, however, these crossbands reach a more complete development as rhombic markings, so that both descriptions may be correct, though a backward direction of the chevrons is normal.

The juvenile coloration is even more distinct than in Müller's description. The smallest specimen (137 mm.) is dark brown above; a white line from the rostral over the canthus, above the eye, across the temporals to the corner of the mouth, joining a second on the border of the upper labials. A prominent white V, with the apex at the parietal suture, on the nape, edged anteriorly with darker brown. About 18 dark chevrons, the points directed backward, most distinct at midbody. Venter anteriorly with dark crossbands the light interspaces invading the sides. Three of these are distinct and subequally spaced, while the remainder are indicated only by symmetrical white notches reaching the third scale row, the notch as wide as 2 ventrals, the interspace about 14. The tail has a white band, 5 dorsal scales in width, at its base, and another, 2 scales wide, near the tip. No. 11788, 171 mm. in length, agrees perfectly with this description while in a specimen of 248 mm. the tail bands are entirely lost.

Of the characters of the juvenile color pattern, the white V on the nape is most persistent, although in many of the adults of the present series (unfortunately much darkened by preservation in formalin) it is entirely invisible. The dark chevrons are frequently entirely obscured, the dorsal color being a uniform glossy bluish olive. As in *Causus rhombeatus*, the presence of white marks on the edges of the scales, originally probably as outlines of the dark chevrons, is an inconstant character; these crossrows of white spots may persist after the entire disappearance of any other color pattern.

ATRACTASPIS Smith

Atractaspis irregularis (Reinhardt)

Plate XVIII, Figure 2

Elaps irregularis REINHARDT, 1843, Danske Vidensk. Selsk. Afh., X, p. 264, Pl. III, figs. 1–3.

Atractaspis irregularis JAN, 1858, Rev. Mag. Zool. p. 518. BOULENGER, 1896, 'Cat. Snakes,' III, p. 513; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 280. TORNIER, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 84. WERNER, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 143. BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 447. JOHNSTON, 1906, 'Liberia,' II, p. 808, fig. 306. WERNER, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1886. STERNFELD, 1908, Mitt. Zool. Mus. Berlin, IV, p. 222. BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167. STERNFELD, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. BOULENGER, 1915, Proc. Zoöl. Soc. London, pp. 223, 640. CHABANAUD, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 382.

Loveridge, 1916, Journ. E. Africa Uganda Nat. Hist. Soc., V, No. 10, p. 80. Chabanaud, 1917, Bull. Mus. Hist. Nat., Paris, XXIII, p. 14. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 29; 1920, Proc. Zoöl. Soc. London, p. 298. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 472.

Four specimens from the forest border: A. M. N. H. No. 12353 (November 1910), 12355–56 (April and May 1913), Niangara; 12357 (June 1913), Rungu.

The distribution of the species of *Atractaspis* is interesting, although the scarcity of individuals and records introduces an element of uncertainty into deductions of range, counterbalanced, perhaps, by the recognized value of burrowing forms for the discussion of distributional problems. *Atractaspis irregularis* appears to be a forest border species, ranging from Liberia and Togo to Uganda and thence to San Salvador du Congo and Chinchoxo on the southern border. The two localities added by the present collection link the Nigerian records with those from the lake region.

The four specimens are very uniform in essential characters. The largest measures 578 mm., tail 34 mm., .06 of the length. The ventrals number from 231–244, the subcaudals 22–25. The dorsal scales are 25–25–31, in two specimens, 25–27–21 and 25–27–23 in the others. The upper labials are 5, the lower 5 in one specimen, 6 in three.

No field notes regarding the habits of this species are available, the specimens having been secured by natives.

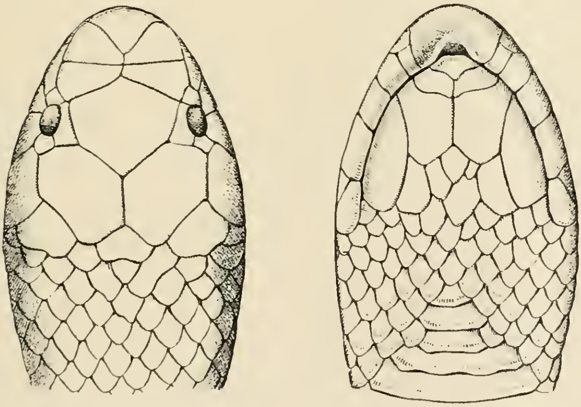


Fig. 15. Dorsal and ventral views of head of *Atractaspis corpulenta* (Hallowell), (12358, × 2).

Atractaspis corpulenta (Hallowell)

Brachycranion corpulenta Hallowell, 1854, Proc. Acad. Nat. Sci. Phila., p. 99.

Atractaspis corpulentus Hallowell, 1857, Proc. Acad. Nat. Sci. Phila , p. 70.

Atractaspis corpulenta Boulenger, 1896, 'Cat. Snakes,' III, p. 514. Johnston, 1906, 'Liberia,' II, p. 808. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 417. Werner, 1913, Mitt. Nat. Mus. Hamburg, XXX, p. 32. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 223; 1919, Rev. Zool. Africaine VII, p. 29; 1920, Proc. Zoöl. Soc. London, p. 298.

A single specimen, A. M. N. H. No. 12358, taken at Medje, in April 1914, extends the range of this species throughout the forest area. It has been previously recorded from Liberia, Cameroon, and Gaboon.

The specimen, a male, measures 521 mm., of which the tail occupies 46 mm. (.09 of the total length). Ventral plates, 1915, subcaudals, 25; dorsal scales 23-25-20; five upper and six lower labials.

Atractaspis bibroni Smith

Atractaspis bibroni Smith, 1849, 'Ill. Zoöl. S. Africa, Rept.,' Pl. lxxi. Boulenger, 1896, 'Cat. Snakes,' III, p. 515; 1908, Ann. Natal Mus., II, p. 231. Odhner, 1908, Ark. Zool., Stockholm, IV, No. 8, p. 6. Boulenger, 1910, Ann. S. African Mus., V, p. 523. Peracca, 1910, Boll. Mus. Torino, XXV, No. 624, p. 5. Sternfeld, 1910, Mitt. Zool. Mus. Berlin, V, p. 58; 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 251. Nieden, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 450. Werner, 1913, Mitt. Nat. Mus. Hamburg, XXX, p. 34. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 640.

Atractaspis rostrata Günther, 1868, Ann. Mag. Nat. Hist., (4) I, p. 429, Pl. xix, fig. 1. Boulenger, 1896, 'Cat. Snakes,' III, p. 514. Roux, 1910, Rev. Suisse Zool., XVIII, p. 100. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 640.

A single juvenile specimen, A. M. N. H. No. 12354, taken at Garamba in June 1912, is referred to this species.

Whether identified as *Atractaspis rostrata* or *bibroni* this specimen extends the range of the species to the northeast, and adds a species of distinctly East African origin to the Sudanese fauna. The overlapping of East African species into the Sudanese Subprovince is in fact a much less frequent phenomenon than the reverse.

The writer follows Werner (1913, p. 33) in uniting *Atractaspis rostrata* with *A. bibroni*, although with some hesitation. Unfortunately there is no available material of the latter species for comparison, and the single juvenile specimen at hand does not suffice for a definite conclusion. In one respect, however, and in what Werner regards as the most important for a possible distinction of the two species, the present specimen completes his argument for uniting the two. He finds that the northern (Tanganyika Territory) specimens (*rostrata*) have 23 dorsal scale rows, the southern (typical *bibroni*), 21. The present specimen agrees with *bibroni* in having 21 dorsal scales and with *rostrata* in having a well-defined horizontal edge on the rostral.

Total length 205 mm., tail 13 mm. The ventral plates number 246, the subcaudals 24. The dorsal scale count is 19–21–19. Labials 5 above and below.

The color is brown, the scales distinct.

Atractaspis aterrima Günther

Atractaspis aterrima Günther, 1863, Ann. Mag. Nat. Hist., (3) XII, p. 363. Boulenger, 1896, 'Cat. Snakes,' III, p. 515. Mocquard, 1896, Bull. Mus. Hist. Nat., Paris, II, p. 60. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 447; 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 216. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, Pl. I, p. 1886. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 417; 1910, IV, p. 222. Boulenger, 1915, Proc. Zoöl. Soc. London, p. 640; 1920, p. 298. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 472.

A single specimen, A. M. N. H. No. 12352, collected at Niangara in November 1910, links the west African records (Portuguese Guinea to Cameroon) with the central African (Uganda), and the species illustrates a consistent Sudanese range, as *Atractaspis corpulenta* does a forest distribution.

The specimen measures 569 mm., tail 32 mm. The ventral plates number 277, the subcaudals 24. The dorsal scales are 19–21–19. The labials number 5 above and 6 below. It agrees with the description of Boulenger (1896, p. 575) in every respect except for the extension of the large temporal to the labial border, between the fourth and fifth upper labials; an anomaly readily enough accounted for as an individual character.

"Was tied to a stick and appeared to be lifeless. Intending to take it behind the head, I was surprised at the extraordinary rapidity of its movements. It succeeded in stabbing me with one of its fangs near the finger nail; but immediate application of permanganate of potash probably prevented serious developments. The natives regard them as very poisonous" (H. Lang).

Atractaspis heterochilus Boulenger

Atractaspis heterochilus Boulenger, 1901, Ann. Mus. Congo, (1) II, p. 13, Pl. v, fig. 1; 1915, Proc. Zoöl. Soc. London, p. 223; 1919, Rev. Zool. Africaine, VII, p. 29; 1920, Proc. Zoöl. Soc. London, p. 298.

The second specimen, A. M. N. H. No. 11901, of this distinct species was collected at Medje, the type locality being Albertville on the Tanganyika. Although the latter locality is outside the actual limit of the

Rain Forest, there can be no question that it is to be considered a forest species, particularly as its closest relations are with *Atractaspis reticulata* from the forest of Cameroon.

The specimen recorded by Werner (1913, Mitt. Nat. Mus. Hamburg, XXX, p. 32) appears to be more closely related to *Atractaspis reticulata* than to *A. heterochilus.* The present specimen has 353 ventral plates, the one recorded by Boulenger 341, and it agrees in having 23 dorsal scale rows. *A. reticulata* has 308–330 ventrals and 21 dorsal scales. Werner's specimen agrees with the latter in number of ventrals (328) and with *A. heterochilus* in having 23 dorsal scales. Taking into account the type locality of each species it seems simplest to amend the diagnosis of *A. reticulata* to "dorsal scales 19–23," rather than to extend the range of ventrals in *heterochilus* from 353 to 328. Indeed, on the latter basis, the two species must be united. It seems preferable to emphasize the difference in number of ventrals between the specimens from the Gaboon-Cameroon area, and those from the eastern part of the Rain Forest, although the two forms are certainly closely related, and may prove to be subspecies.

The specimen is a male of 816 mm. length, of which the tail measures 30 mm., Boulenger's specimen measuring 520 mm. The ventrals number 353, the subcaudals 23; the dorsal scales are 19–23–19, as in the Tanganyika specimen. In every character of head scales it agrees perfectly with Boulenger's figure and description. The pink mental and supralabials appear to be a unique and distinctive color character, still plainly marked in the alcoholic specimen.

"General color dark bluish gray, the dorsal scales light-edged, making them very evident. Ventrals similarly edged with gray. Mental and first lower labials pink, as are the first upper labials. Taken on the ground in the forest" (H. Lang).

Bitis Gray

Bitis arietans (Merrem)

Plate XXII, Figure 1

Vipera (Echidna) arietans Merrem, 1820, 'Tent. Syst. Amphib.,' p. 152.

Bitis arietans Günther, 1858, 'Cat. Snakes,' p. 268. Boulenger, 1896, 'Cat. Snakes,' III, p. 493; 1897, Proc. Zoöl. Soc. London, p. 801; Ann. Mag. Nat. Hist., (6) XIX, p. 280. Johnston, 1897, 'British Central Afrika,' p. 361*a*. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 401. Ferreira, 1898, Jorn. Sci. Lisboa, (2) IV, p. 245. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 447; Proc. Zoöl. Soc. London, II, p. 18. Lampe, 1902, Jahrb. Nassau. Ver. Naturk., LV, p. 42. Shenkel, 1902, Verh. Naturf. Ges. Basel, XIII, p. 178. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, pp. 336, 348. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 216; Proc. Zoöl. Soc. London, p.

255; 1907, p. 487; Mem. Proc. Manchester Lit. Philos. Soc., LI, part 3, p. 12. Roux, 1907, Zool. Jahrb. (Syst.), XXV, p. 740. Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1885. Boulenger, 1908, Ann. Natal Mus., I, p. 230. Gough, 1908, Ann. Transvaal Mus., I, p. 39. Odhner, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 6. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, IV, pp. 221, 245, 247. Werner, 1908, 'Rept. Wellcome Res. Lab. Khartoum,' p. 182, Pl. xviii, fig. 1. Boulenger, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 303. Chubb, 1909, Extr. C. R. Soc. Linn. Bordeaux, p. cvi. Pellegrin, 1909, Bull. Mus. Hist. Nat., Paris, XV, p. 414. Boulenger, 1910, Ann. S. African Mus., V, p. 522. Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 18. Meek, 1910, Publ. Field Mus., Zoöl., VII, p. 405. Peracca, 1910, Boll. Mus. Torino, XXV, No. 624, p. 5. Roux, 1910, Rev. Suisse Zool., XVIII, p. 99. Sternfeld, 1910, Mitt. Zool. Mus. Berlin, V, p. 385. Werner, 1910, Denschr. Med. Naturw. Ges. Jena, XVI, p. 366. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167. Lönnberg, 1911, Svenska Vetensk.-Akad. Handl., Stockholm, XLVII, No. 6, p. 24. Sternfeld, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 251. Fitzsimons, 1912, 'Snakes of South Africa,' p. 220, figs. 89–94. Peracca, 1912, Ann. Mus. Zool. Napoli, (2) III, p. 7. Sternfeld, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 277. Boettger, 1913, 'Wiss. Ergeb. Reise Ostafrika, Voeltzkow,' III, pp. 354, 362, 364. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 165. Klaptocz, 1913, Zool. Jahrb. (Syst.), XXXIV, p. 287. Werner, 1913, in Brehm's 'Tierleben,' 4th Ed., V, p. 518. Pellegrin, 1914, in 'Doc. Sci. Miss. Tilho,' III, p. 126. Boulenger, 1914, Proc. Zoöl. Soc. London, pp. 221, 638, 657. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, pp. 80, 382; 1917, XXIII, p. 13; 1918, XXIV, p. 166. Loveridge, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 316. Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, XXV, p. 568. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 28. Werner, 1919, Denkschr. Akad. Wiss. Wien, math. naturw. Kl., XLVI, p. 509. Boulenger, 1920, Proc. Zoöl. Soc. London, p. 296. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 472.

Vipera arietans Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 86.

Fifteen specimens of the puff adder were collected as follows: A. M. N. H. No. 11794 (February 1911), 11795–96 (March 1911), 11797 (April 1911), 11798 (July 1912), Faradje; 11789–93 (November 1910), 11802–03 (June 1913), Niangara; 11800 (August 1913), Poko; 11799 (June 1913), Rungu; 11801 (tag corroded), Uele District, Belgian Congo.

Bitis arietans is scarcely less common and even more widespread than *Causus rhombeatus*, but does not occur within the borders of the Rain Forest. Its range covers almost the whole of Africa except the forest, extending nearly to the forest border, as at Poko. Its occurrence in Barbary and Arabia is of especial interest. For further discussion of the distribution of this genus, see below, under *Bitis nasicornis*.

The fifteen specimens examined are very uniform in coloration and in scale characters. The largest specimen measures 808 mm. The tail length varies in the males from .10 to .14 of the total, in the females from .06 to .08. The ventrals number from 137 to 147; the females from 17 to 19. 29–33–23 may be accepted as the most usual scale count, with extremes at 27–29–21 and 31–35–23. Uniformly 1 scale between nasal and rostral, 2 between the nasals, 2 between the oculars and labials. 8–10 scales from eye to eye, 12–15 about the eye. Upper labials 12–14, lower, 15–18.

The color and marking of the specimens from the Uele District is in every way normal and not distinguishable from that of either more southern or more northern specimens.

Bitis gabonica (Duméril and Bibron)

Plate XX

Echidna gabonica Duméril and Bibron, 1854, 'Erpétol Gén.,' VII, p. 1428, Pl. lxxx*b*.

Bitis gabonica Buolenger, 1896. 'Cat. Snakes,' III. p. 449. Johnston, 1897 'British Central Africa,' p. 361*a*. Werner, 1899, Verh. Zool. -Bot. Ges. Wien, XLIX, p. 142. Boulenger, 1902, in Johnston, 'Uganda Protectorate,' p. 447. Johnston, 1902, 'Uganda Protectorate,' pp. 94, 409, color plate. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 348. Ferreira, 1903, Jorn. Sci. Lisboa, (2) VII, p. 14. Johnston, 1906, 'Liberia,' II, p. 807, fig. 306. Boulenger, 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, No. 12, p. 12. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 416; IV, p. 221. Vossler, 1908, Zool. Beob. Frankfurt, XLIX, p. 167, Pl. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 617. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 442. Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167. Müller, 1913, Zool. Anz., XLI, p. 234. Werner, 1913, in Brehm's 'Tierleben,' 4th Ed., V, p. 524. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 221, 638; 1919, Rev. Zool. Africaine, VII, p. 28; 1920, Proc. Zoöl. Soc. London, p. 296. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 472.

Twenty-five specimens of the Gaboon viper were collected, of which fourteen are preserved in alcohol and eleven represented by dried skins and skulls. The following localities are represented: A. M. N. H. Nos. 11812–14, 11815–20 (September and October 1913), Akenge; 11808 (November 1909), 11809–10 (September and November 1913), Avakubi; 11804 (February 1910), Gamangui; 11805 (June 1910), 11825 (December 1913), Medje; 11806–07, 11811, 11826 (November 1910), Niangara; 11821–22, 11823–24 (October and December 1913), 10093 (January 1914), Niapu; 11827 (tag corroded), Belgian Congo.

This species ranges throughout the forest and is recorded from Togo, Angola, Northern Rhodesia, and Tanganyika Territory outside of the forest proper, closely paralleling the distribution of certain lizards, *Mabuya maculilabris* for example. The distribution of the species of this genus has been mapped in connection with the discussion of *Bitis nasicornis*, below.

Scale characters are fairly constant in this series. The extremes and means of length and proportionate tail length are, in seven males, 414–1100 mm., mean 682 mm., tail length .09 to .12, mean .10; in six females the extremes are 443–1297 mm., mean 782 mm., tail length .05 to .06, mean .06. The sexes are sharply distinguished by this character and also by the number of subcaudals, which is 18–20 in females, 27–32 in males. The ventrals number from 128 to 139. The scales about the body are normally 39, varying from 35 to 43. The extremes in scale count are 33–35–25 and 39–43–27. The upper labials vary from 13–16, the lower from 16–19.

Stomach contents are recorded in two specimens, No. 11812 contained a large bird (a rail) about the size of a pigeon, No. 11823, a water rat. Frogs are also taken.

Bitis nasicornis (Shaw)

Plate XXI

Coluber nasicornis Shaw, 1802, 'Nat. Miscell.,' III, Pl. xciv.

Bitis nasicornis Büttikofer, 1890, 'Reisebilder aus Liberia,' II, p. 444. Boulenger, 1896, 'Cat. Snakes,' III, p. 500. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 17. Sjöstedt, 1897, Bihang Svenska Vetensk.-Akad. Handl., Stockholm, XXIII, part 4, p. 27. Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 142. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 445. Tornier, 1901, Zool. Anz., XXIV, p. 64. Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 44. Boulenger, 1905, Ann. Mus. Stor. Nat. Genova, (3) II, p. 216. Johnston, 1906, 'Liberia,' II, p. 807, fig. 306; 1908, 'George Grenfell and the Congo,' II, p. 950. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 416; 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 199. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 222, 638. Chabanaud, 1916, Bull. Mus. Hist. Nat., Paris, XXII, p. 382. Loveridge, 1918, Journ. E. Africa Uganda Nat. Hist. Soc., No. 13, p. 316. Boulenger, 1919, Rev. Zool. Africaine, VII, p. 28; 1920, Proc. Zoöl. Soc. London, p. 296. Chabanaud, 1921, Bull. Com. Études Hist. Scient. Afrique Occ. Française, p. 472.

Vipera nasicornis Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 85.

Thirty specimens of this species were collected, sixteen preserved in alcohol, fourteen represented by dried skins and skulls, from many localities in the forest: A. M. N. H. Nos. 11840–42, 11843 (September and October 1913), Akenge; 10090, 11831, 11854 (October 1909), Avakubi; 11830 (September 1909), Batama; 11832–36 (February 1910), Gamangui; 11837–38 (August 1910), 11851, 11852–53 (April and June 1914), Medje; 11844–49, 11850 (November and December 1913), Niapu; 11839 (August 1913), Poko; 11828–29 (August 1909), Stanleyville; 11855–56 (tags corroded), Belgian Congo.

Bitis nasicornis is practically confined to the continuous Rain Forest but has been recorded from Portuguese-Guinea by Boulenger. It is unknown east or south of the forest, and must be considered a typical Rain Forest form.

The color patterns of *Bitis gabonica* and *B. nasicornis* distinguish them immediately from all other species of the genus, and it is natural enough that brown, purple and bright yellow should replace the more grayish hues of the Savannah species. In the case of vipers so formidable as these two species, their patterns are probably to be considered as a warning coloration, although in their natural habitat they are doubtless much less conspicuous than would be supposed.

The specimens range in length from 317 mm. to 1050 mm. The largest female measures 1050 mm., the largest male, 944 mm. The proportion of tail length to total length is .07 to .08 in females, mean .08, in the males, .10 to .15, mean .14. The ventral plates vary from 122 to 132, the subcaudals from 25 to 30 (mean 27) in males, and from 17 to 21 (mean 19) in females. The scale counts range from 29–35–23 to 33–41–25, the most usual being 33–39–23. The labials vary from 16 to 18 above and from 16 to 19 below. There are practically no variations of importance in the scutellation of the head.

A female taken at Gamangui February 16, 1920, contained thirty-one fœtal young, arranged in two rows of fifteen and sixteen respectively. These young, coiled tightly on one side of the remains of the yolk, measure 200 to 210 mm. in length and show the color pattern very distinctly.

Atheris Cope

Atheris squamigera (Hallowell)

Plate XXII, Figure 2

Echis squamigera Hallowell, 1854, Proc. Acad. Nat. Sci., Phila., p. 193.

Atheris squamigera Boulenger, 1896, 'Cat. Snakes,' III, p. 509; 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 280. Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 17. Tornier, 1897, 'Kriechtiere Deutsch-Ost-Afrikas,' p. 85. Werner, 1897, Verh. Zool.-Bot. Ges. Wien, XLVII, p. 401; 1899, XLIX. p. 142. Boulenger, 1900, Proc. Zoöl. Soc. London, p. 456; 1902, in Johnston, 'Uganda Protectorate,' p. 447. Werner, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 348. Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 114; Ann. Mus. Stor. Nat. Genova, (3) II, p. 216. Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 169. Sternfeld, 1908, Mitt. Zool. Mus. Berlin, III, p. 417. Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 617. Despax, 1911, in Cottes, 'La Mission Cottes au Sud-Cameroun,' p. 240. Boulenger, 1915, Proc. Zoöl. Soc. London, pp. 222, 639; 1919, Rev. Zool. Africaine, VII, p. 28; 1920, Proc. Zoöl. Soc. London, p. 297.

Forty-one specimens of *Atheris squamigera* were collected from localities in the Ituri forest: A. M. N. H. Nos. 11868–69 (October 1913), Akenge; 11857–58 (August and October 1909), Avakubi; 11859, 11861–

64 (August and September 1910), 11892–96 (June and July 1910), 11883, 11884–91 (March and April 1914), Medje; 11867 (July 1913), Nala; 11870–77, 11878–82 (November and December 1913), Niapu; 11865–66 (October 1910), Rungu.

This species ranges throughout the main area of the Rain Forest, but does not appear in the Liberian (western) area. It is recorded from Togo to the west and Tanganyika Territory to the east, but is rare in both these areas, where it doubtless occurs only in the forest islands. In the Cameroon and Gaboon region it is very abundant, and it evidently is one of the most common elements of the forest fauna.

The present series is much more uniform than the series referred to by Boulenger (1896, p. 509) from the western part of the forest. The maximum length in twenty males is 657 mm., in twenty females, 712 mm. The proportion of tail length to total varies from .15–.19, mean .18, in the males, and from .14–.18, mean .16, in the females. The ventrals number from 153–163; the subcaudals in males from 50–65 (mean 59), in females from 45–57 (mean 50). The dorsal scale count ranges from 15–15–11 to 23–23–17, the usual count at mid-body being 19, but the number of rows is frequently even. Scales across the head from eye to eye 6–9; scales in the ocular ring 12–18; labials 7–12 above, usually 10, 10–13 below, usually 11. The median scale above the rostral is divided in nine specimens. The scales from the mental to the first ventral plate are usually 6; the gulars from the angle of the mouth to the first ventral 5 or 6.

The suboculars rest directly on the labials without an intervening scale row. The first part of lower labials forms a suture behind the mental in thirty-five specimens, a separate chin-shield being cut off in six.

The coloration is very uniform, and indeed characteristic. The dorsum is dark green, with yellow-tipped scales arranged in about thirty-two crossrows on the body. These crossrows are frequently entirely obscured, but usually persist in a pair of light spots at the edge of the venter. The venter is dark green like the dorsum, the throat yellow.

Stomach contents are recorded as rats and mice in three specimens, and a mass of hair was found in the posterior part of the intestine in two specimens.

Atheris læviceps Bœttger

Atheris læviceps Bœttger, 1887, Zool. Anz., X p. 651; 1888, Ber. Senck. Ges., p 92, Pl. ii, Fig. 7. Bocage, 1895, 'Herpétol. Angola,' p. 153.

Atheris squamiger (part) Boulenger, 1896, 'Cat. Snakes,' III, p. 509.

Two specimens, A. M. N. H. Nos. 11898–99, taken at Banana, Lower Congo, in July 1915.

Comparison of these two specimens with the large series of *Atheris squamigera* from the Ituri leads to the conclusion that they represent a very distinct form. Unfortunately there is no material available for comparison with Gaboon or Cameroon *squamigera;* and in reviving Bœttger's species, described from the identical locality, it is merely desired to emphasize the observed distinction. It seems probable that a subspecific rank may prove the best expression of the relations of *Atheris chloroechis*, *squamigera*, and *læviceps.*

Atheris læviceps is known only from the limited area near the mouth of the Congo.

The chief characters on which *læviceps* is based are (1) a group of smooth scales on top of the head, (2) a row of scales between the suboculars and supralabials, (3) distinctive coloration. Both specimens agree excellently in these characters, but the number of keeless scales on the head is 3–5 instead of 10.

In addition to these characters, direct comparison with *squamigera* establishes a number of other differences, chiefly in minor characters, but apparently correlated. These are (1) distinctive habitus, body more compressed, head smaller, and orbit well arched above the canthus; (2) scales about the body 23–23–15 and 25–25–19, as described by Bœttger; (3) two symmetrical suprarostrals, in both specimens; (4) seven scales from first ventral to the angle of the mouth; (5) seven scales from mental to first ventral (six scales in both directions in *squamigera*); (6) lateral scale rows more oblique; (7) a slightly higher number of supralabials. 11–13 in one, 13–13 in the other.

Both specimens are males, measuring 427 and 407 mm. respectively, of which the tail occupies 64 and 59 mm. Ventral plates 159 and 161, subcaudals 50 and 47. Scales from eye to eye on top of head, 8, in the ocular ring, 15–17.

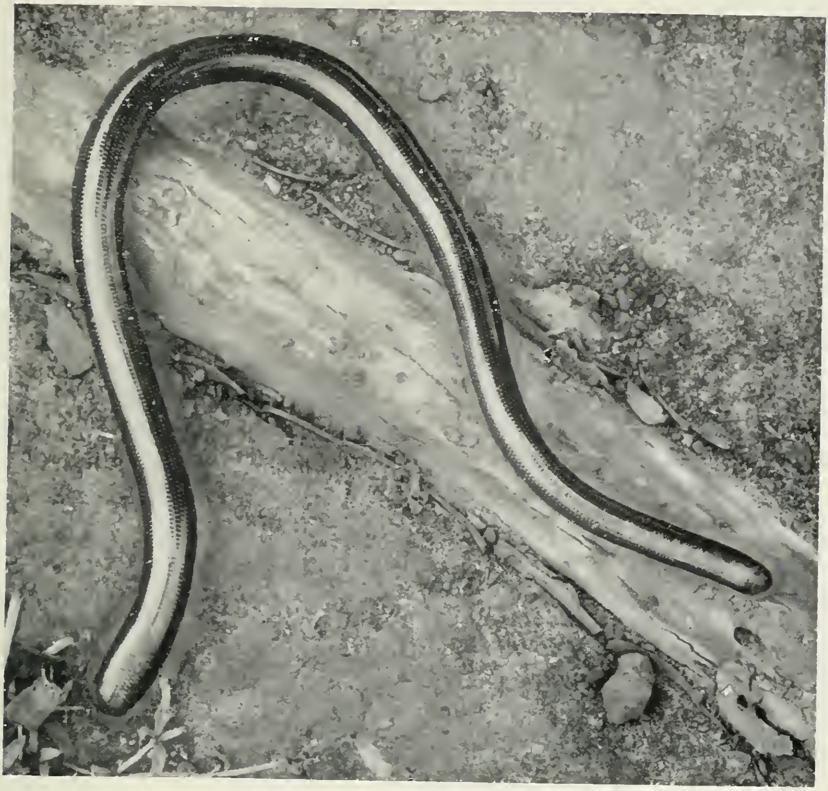
The color of the dorsum is a light yellow mottled over all with green spots (scales), venter immaculate yellow. Müller (1910, p. 617) has described a similar coloration in Cameroon specimens; and Boulenger (1896, p. 509) refers to this coloration in *squamigera*, but bases it possibly on his inclusion of *Atheris læviceps* with that species.

PLATES I TO XXII

PLATE I

Fig. 1. *Typhlops punctatus* (Leach). From life.
Fig. 2. *Python seba* (Gmelin). From dead specimen.

1



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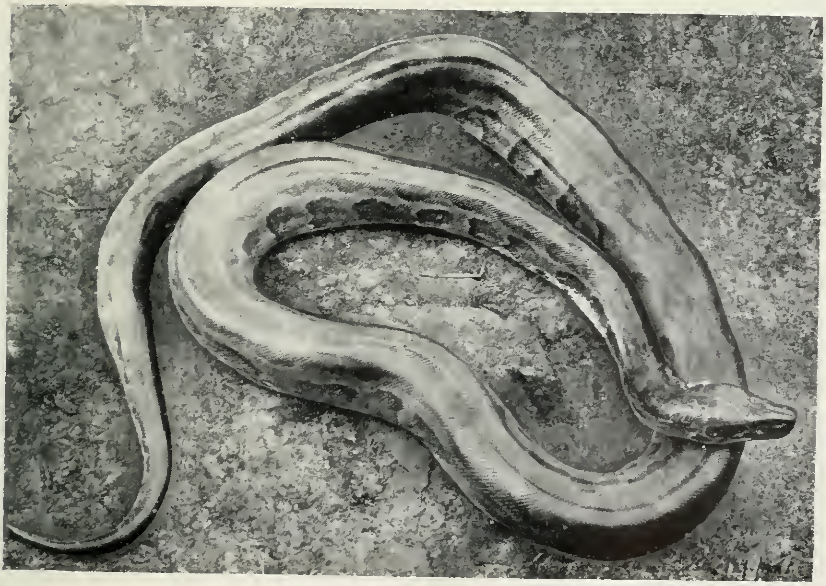
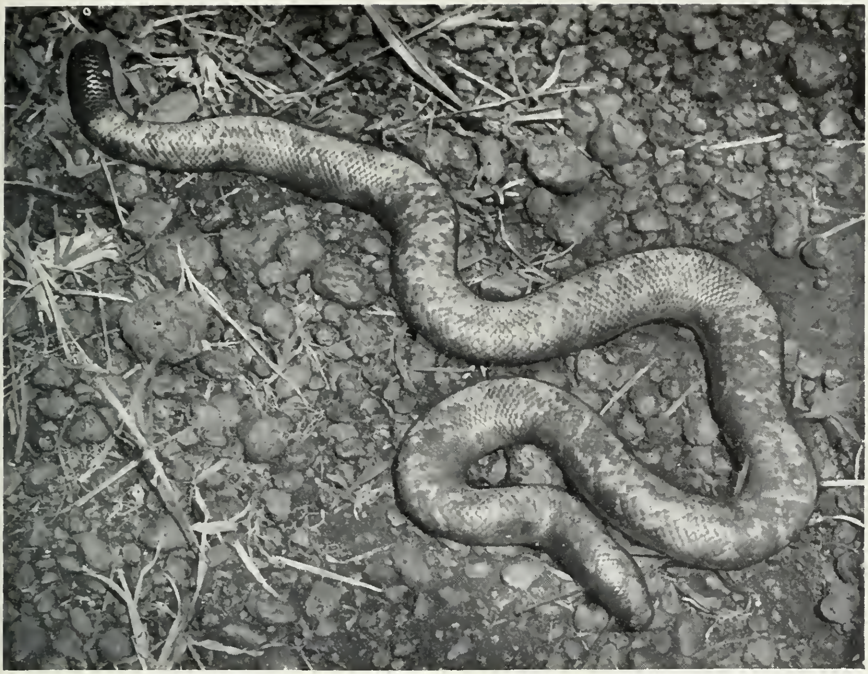


PLATE II

Fig. 1. *Calabaria reinhardtii* (Schlegel). From life.

Fig. 2. *Calabaria reinhardtii* in the characteristic position assumed when disturbed. From life.

1



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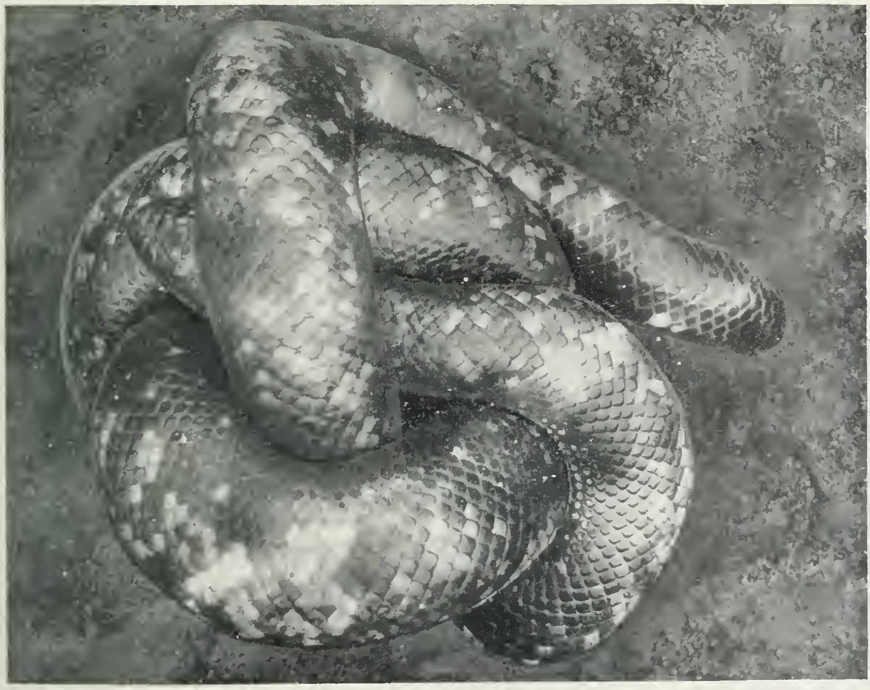
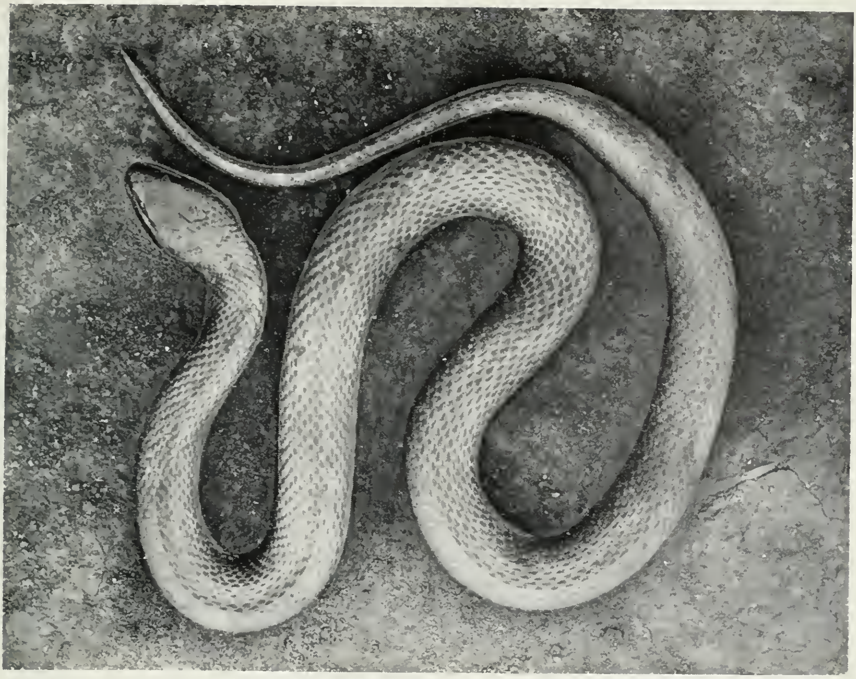


Plate III

Fig. 1. *Hydræthiops melanogaster* Günther. From dead specimen.
Fig. 2. *Dasypeltis scaber scaber* (Linnæus). From dead specimen.

1



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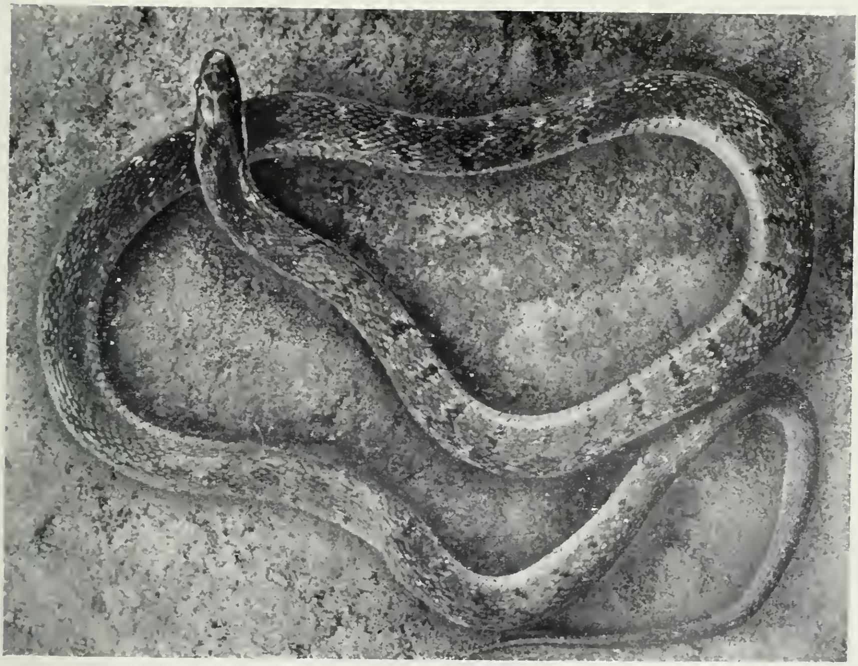

PLATE IV

Fig. 1. *Bothrolycus ater* Günther. From dead specimen.
Fig. 2. *Lycophidion laterale* Hallowell. From dead specimen.

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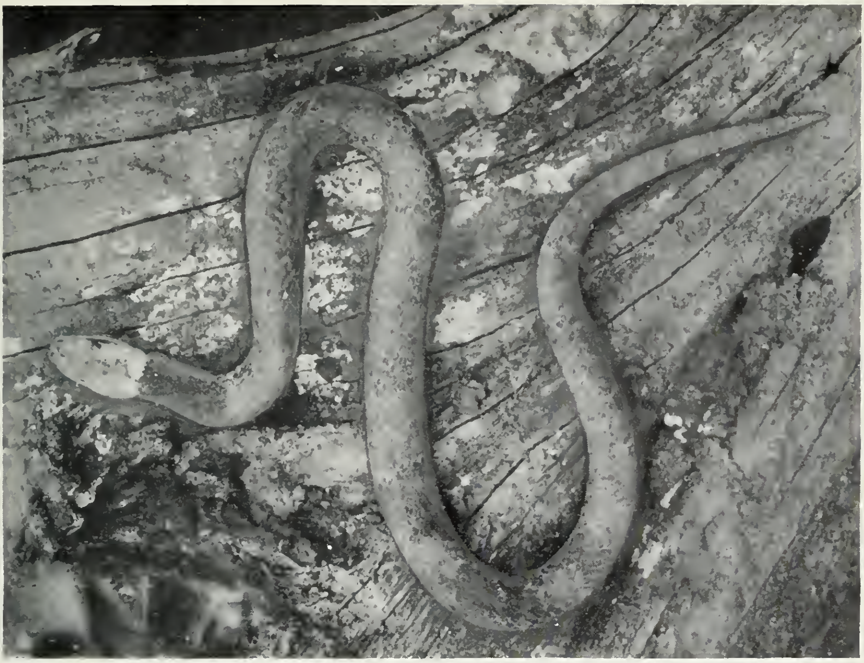

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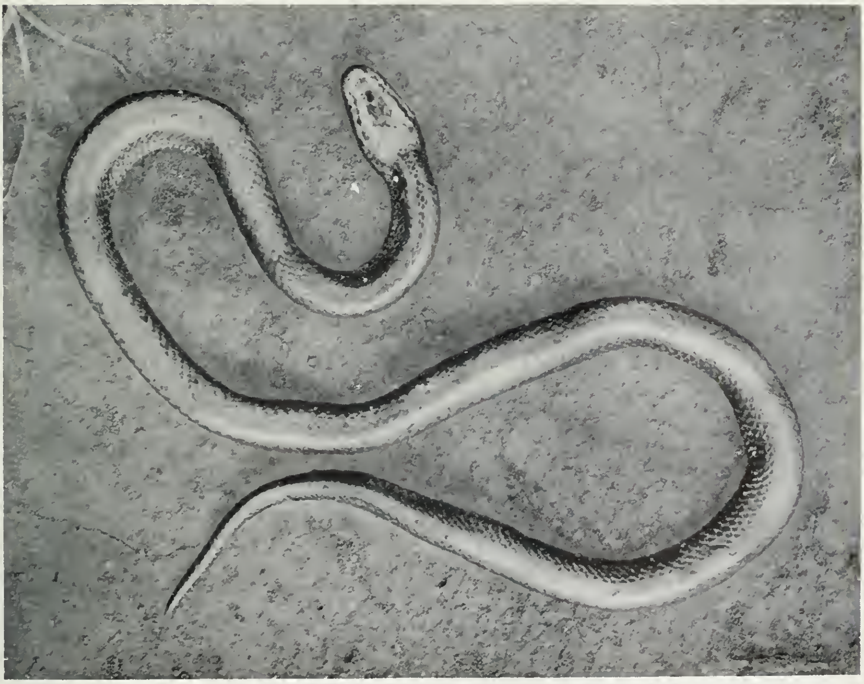


PLATE V

Boædon fuliginosus (Boie). From dead specimen.

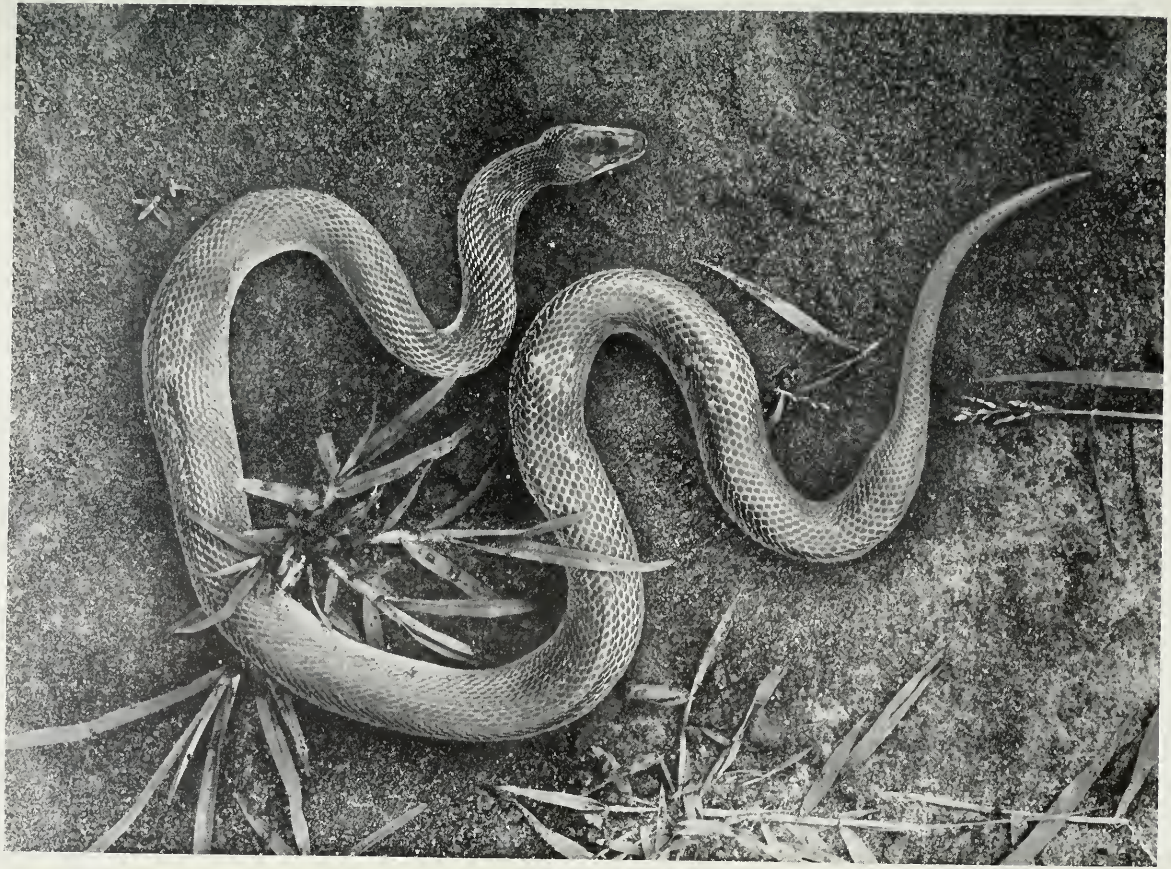
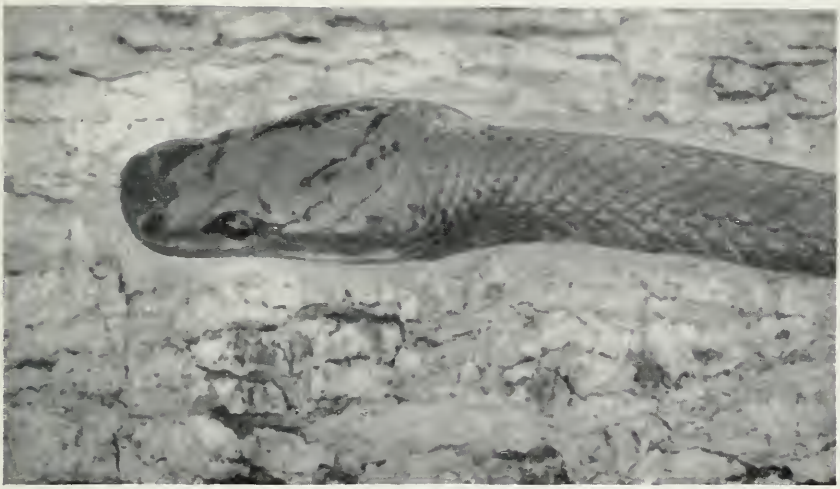


Plate VI

Fig. 1. *Mehelya poensis* (Smith). Head. From dead specimen.

Fig. 2. *Mehelya poensis* (Smith). From dead specimen.

1



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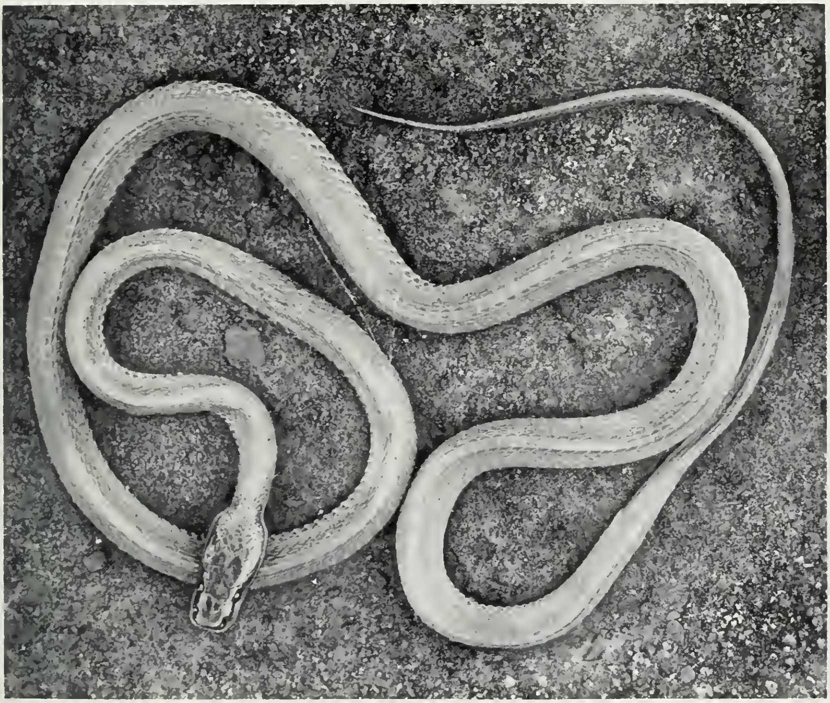


PLATE VII

Gastropyxis smaragdina (Schlegel). From dead specimen.

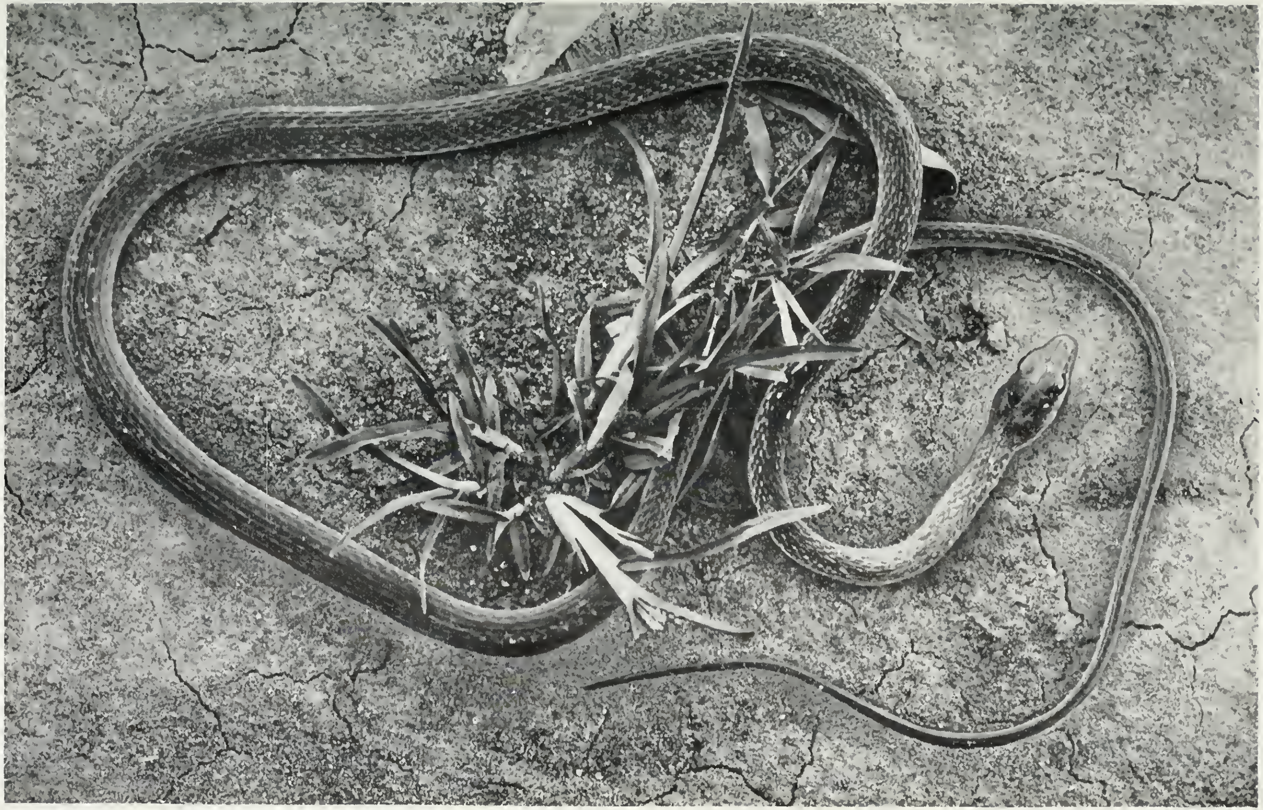


PLATE VIII

Scaphiophis albopunctatus Peters. From dead specimen.

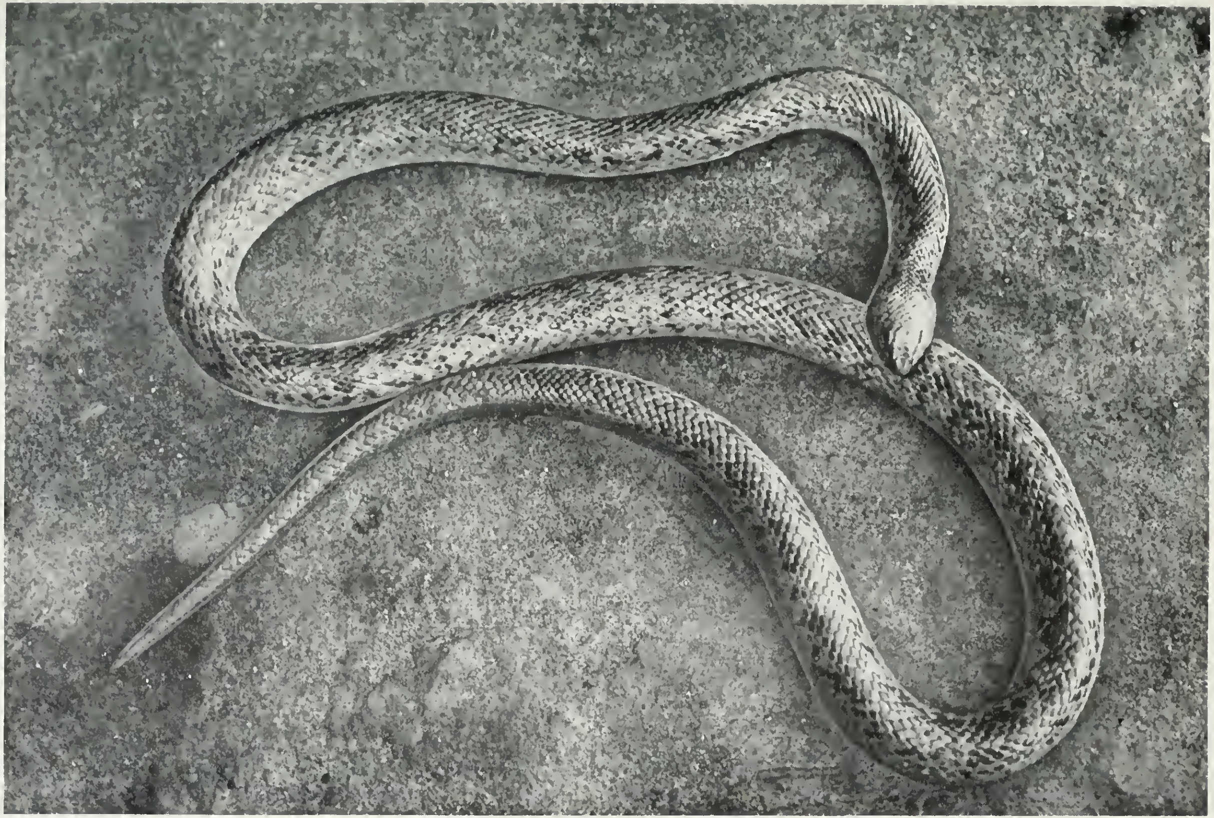
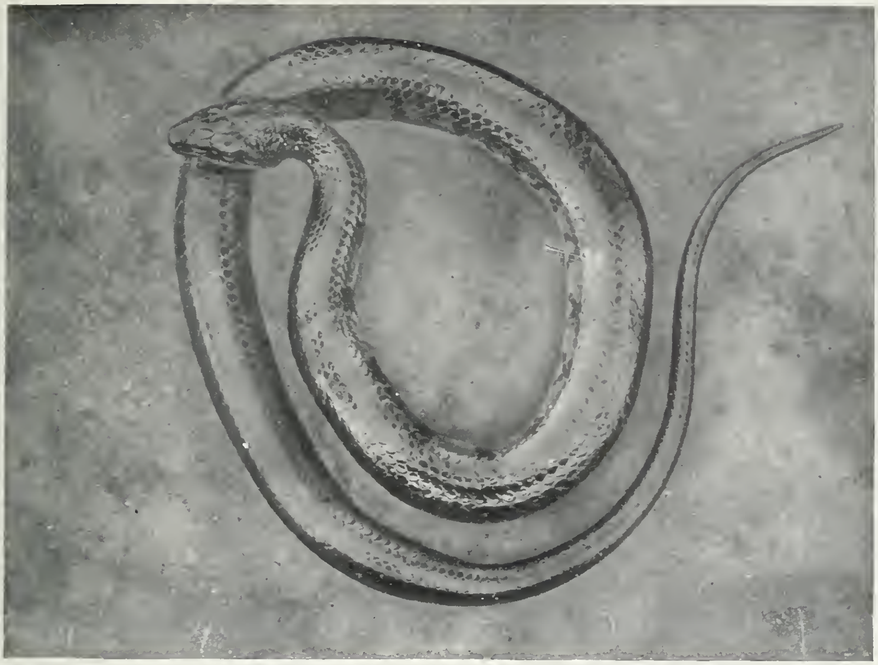


PLATE IX

Fig. 1. *Grayia ornata* (Bocage). From dead specimen.
Fig. 2. *Grayia cæsar* (Günther). From dead specimen.

1



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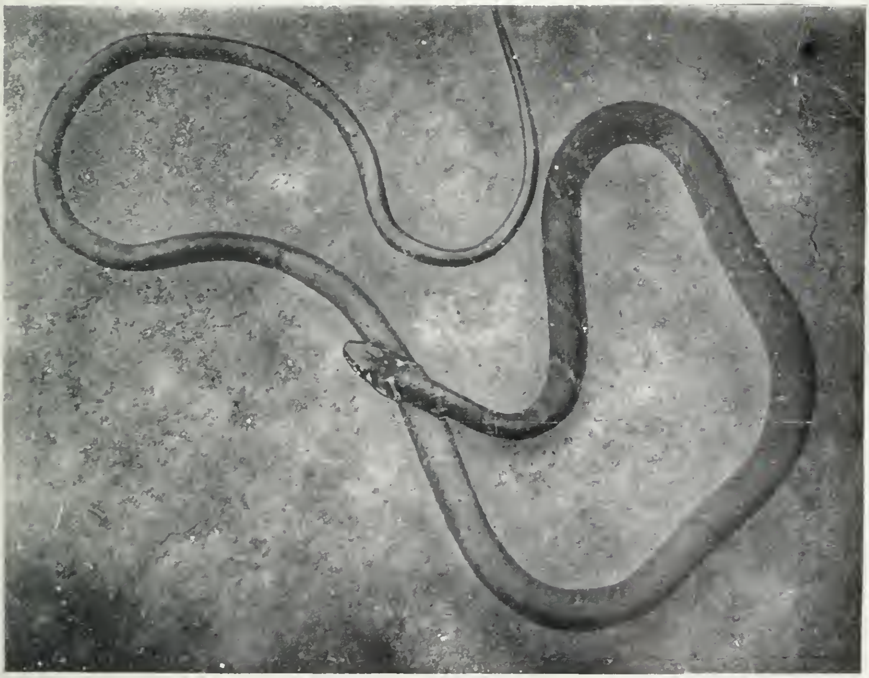


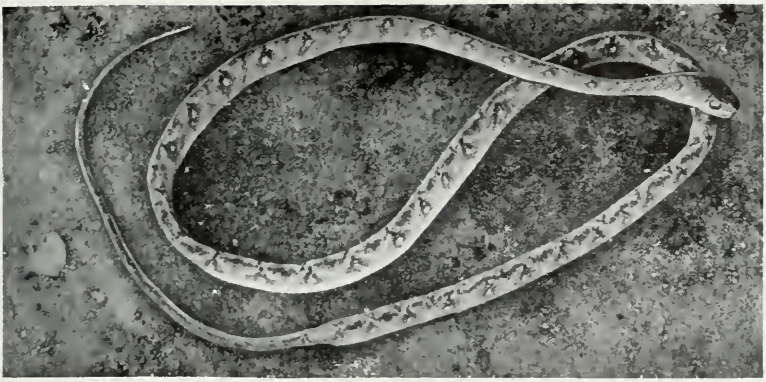
PLATE X

Fig. 1. *Boiga pulverulenta* (Fischer). Juvenile coloration. From dead specimen

Fig. 2. *Boiga pulverulenta* (Fischer). Adult. From dead specimen.

Fig. 3. *Boiga blandingii* (Hallowell). From dead specimen.

1



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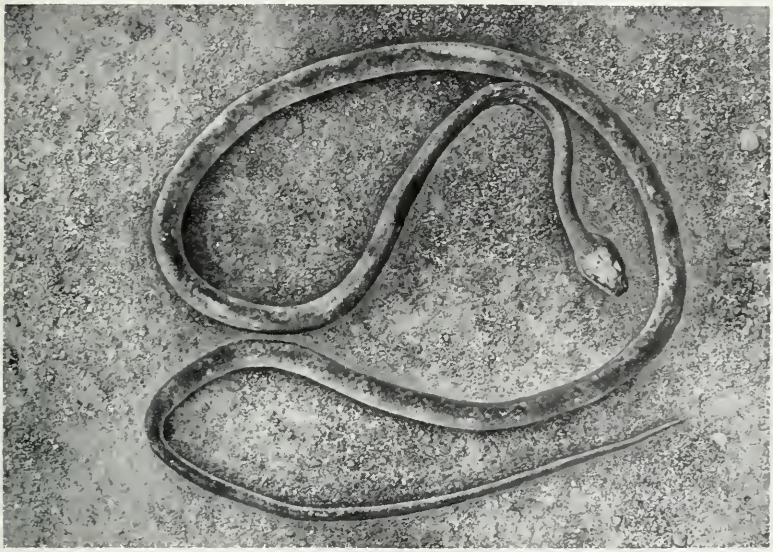

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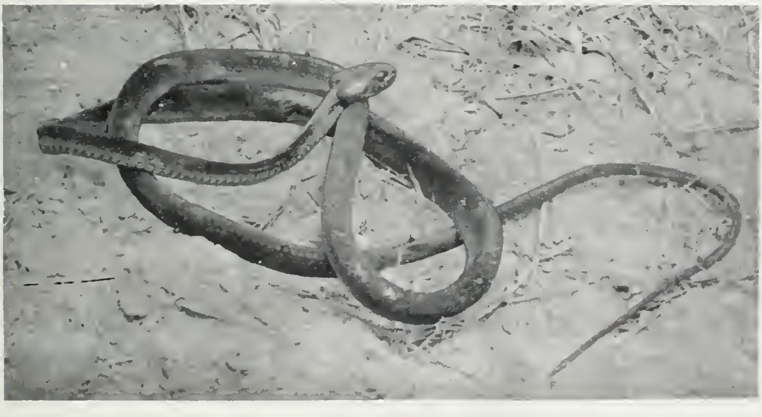
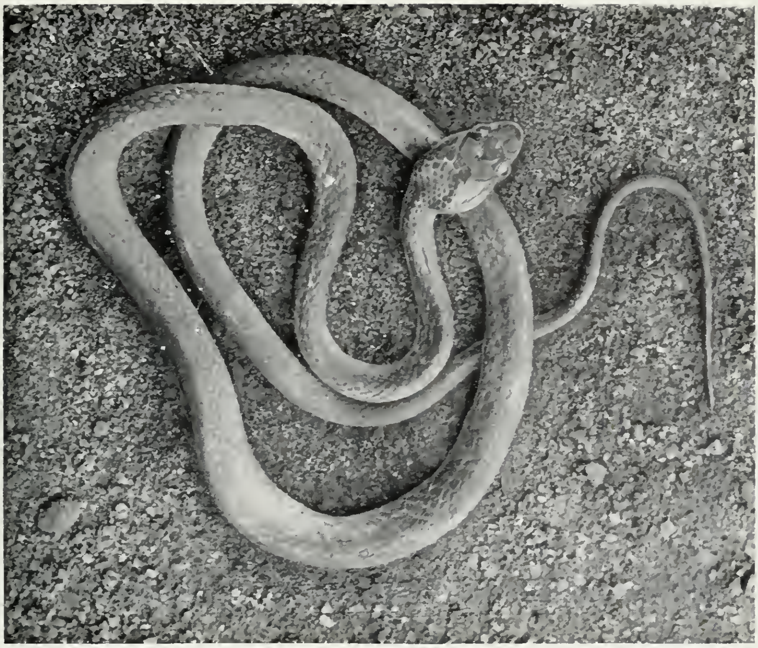


PLATE XI

Fig. 1. *Dipsadoboa unicolor* Günther. From dead specimen.
Fig. 2. *Dipsadoboa elongata* (Barbour). From dead specimen.

1



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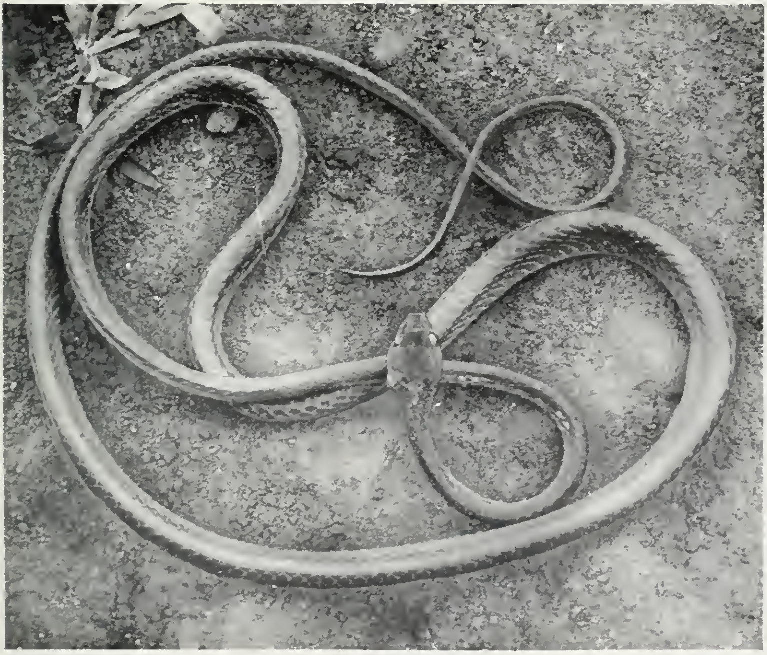
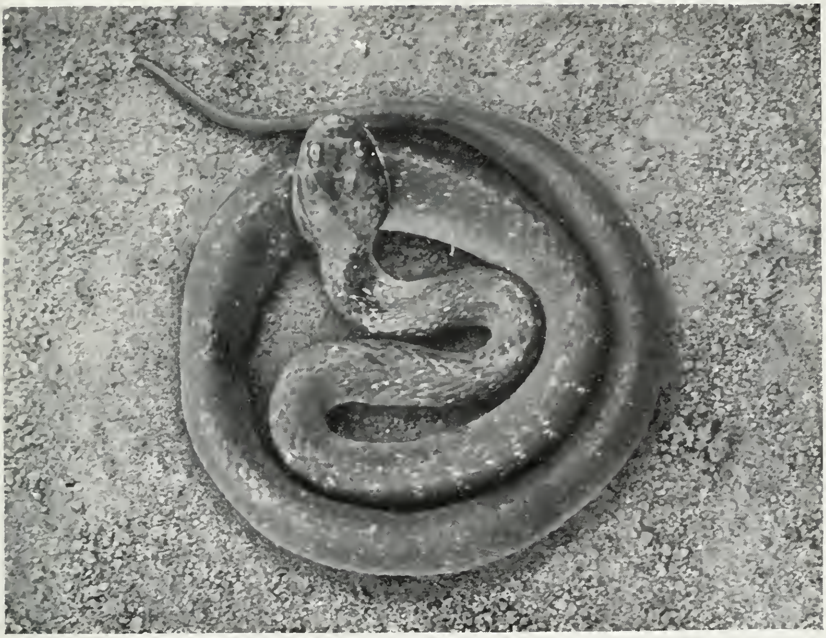


PLATE XII

Fig. 1. *Leptodeira hotambœia* (Laurenti). From dead specimen.

Fig. 2 *Leptodeira duchesnii* Boulenger. From dead specimen.

1



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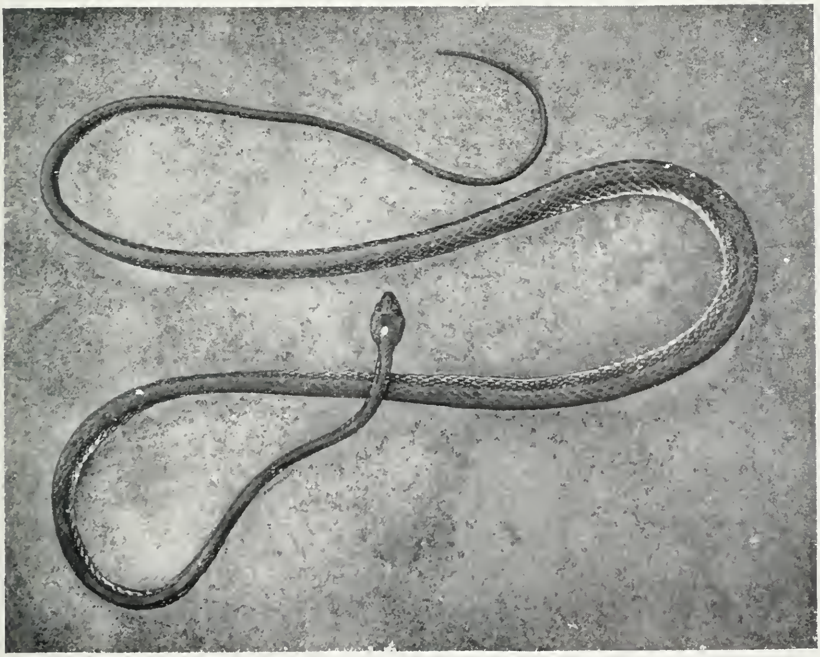


Plate XIII

Dromophis lineatus (Duméril and Bibron). From dead specimen.

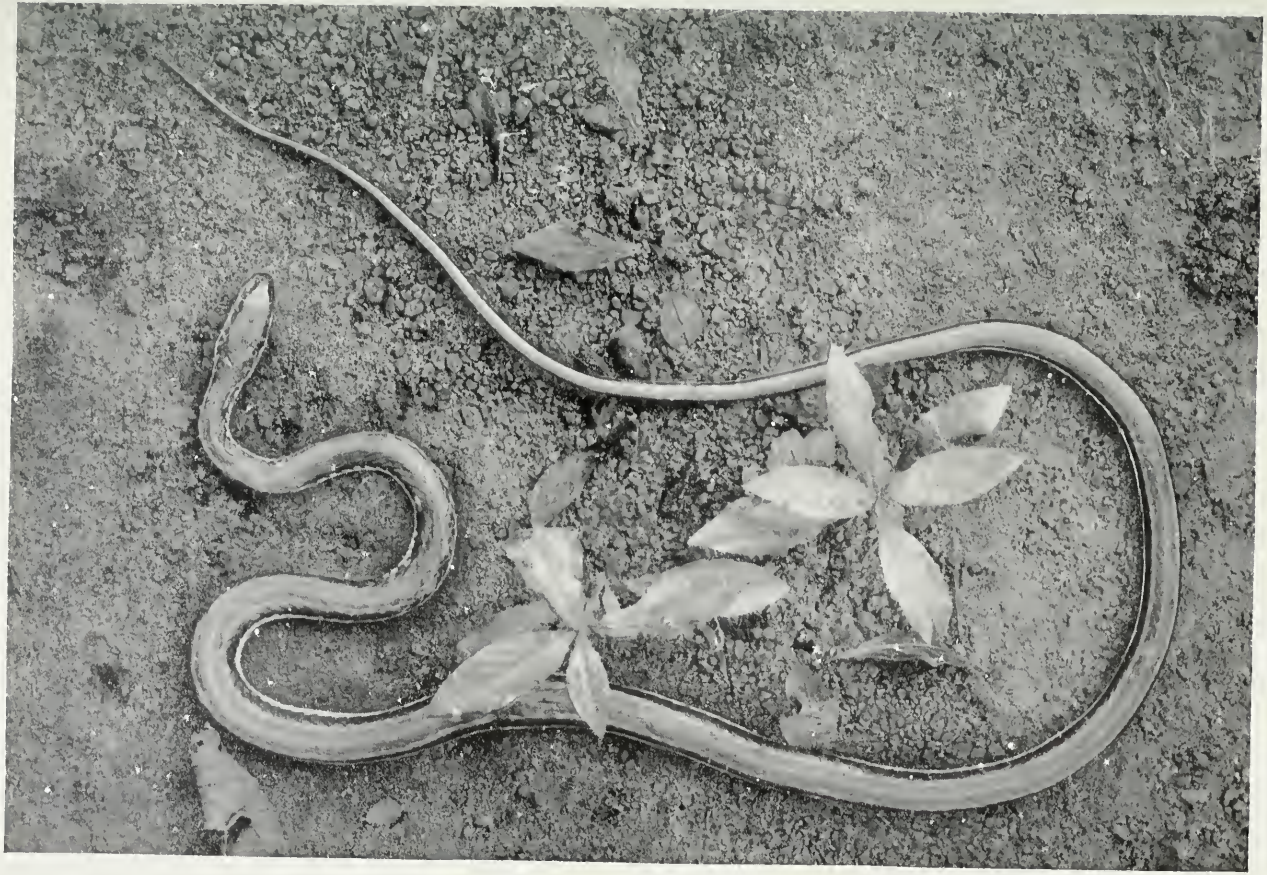
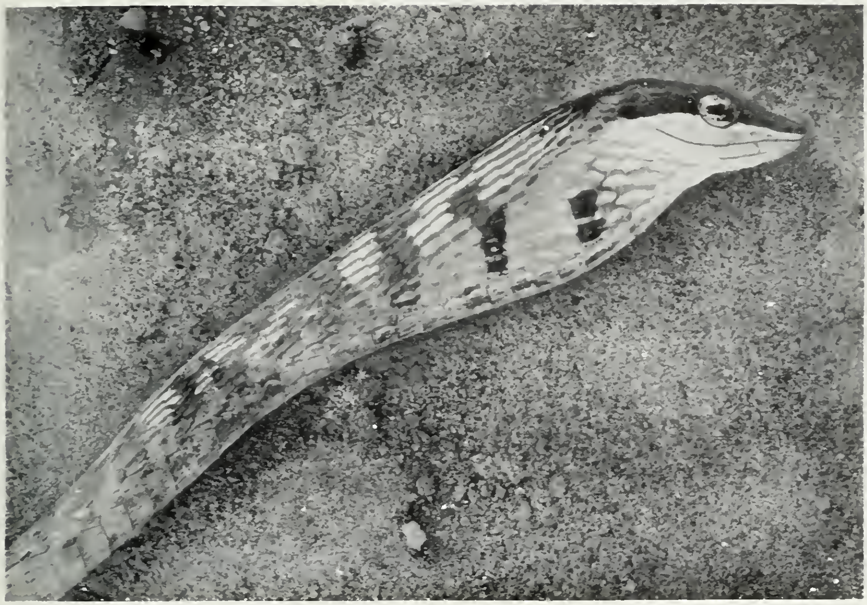


PLATE XIV

Fig. 1. *Thelotornis kirtlandii* (Hallowell). Neck distended. From dead specimen.

Fig. 2. *Thelotornis kirtlandii* (Hallowell). From dead specimen.



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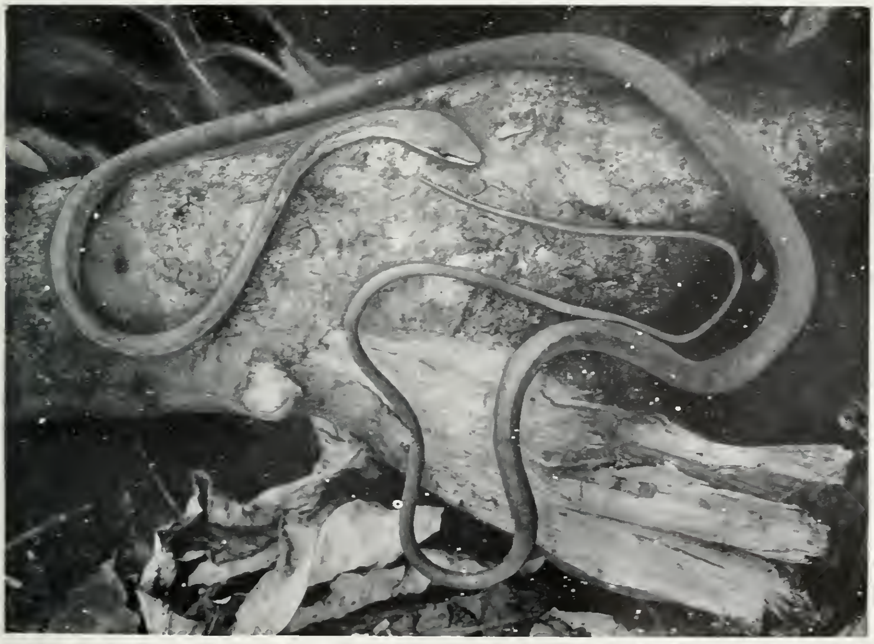

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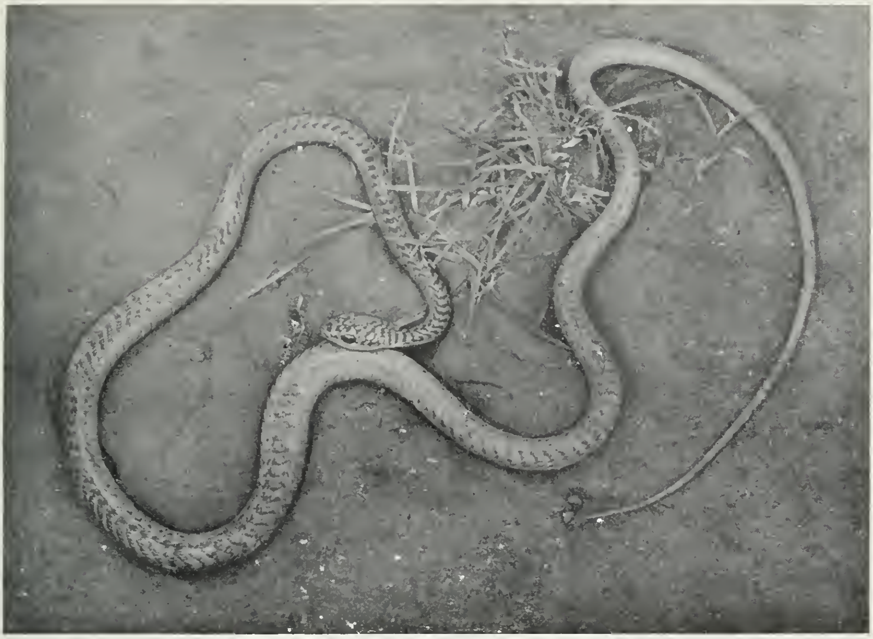
PLATE XV

Fig. 1. *Dispholidus typus* (Smith). Brilliantly colored phase. From dead specimen.

Fig. 2. *Dispholidus typus* (Smith). Dark colored phase. From dead specimen.

1



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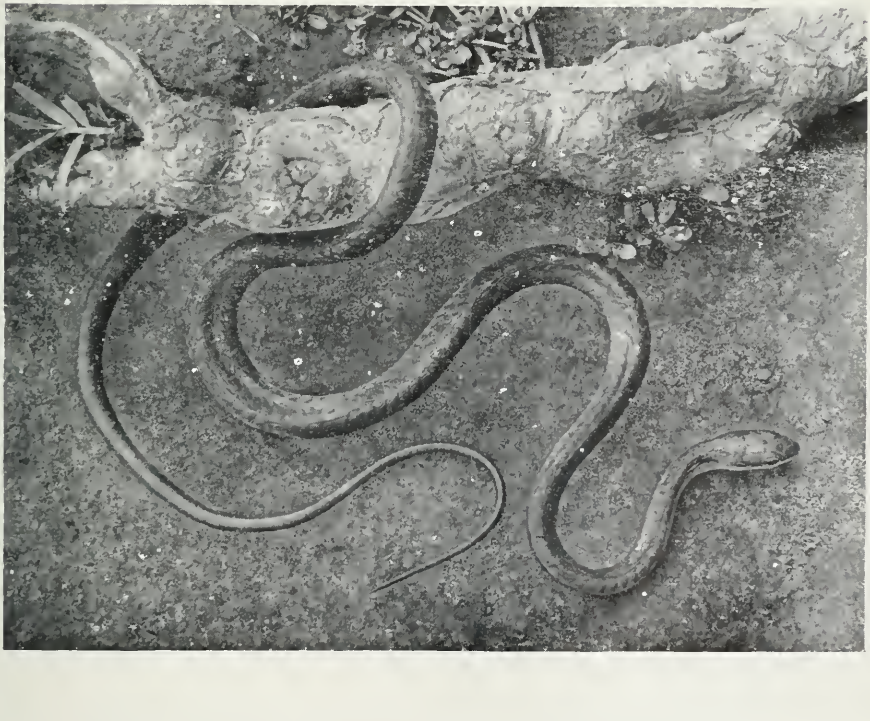
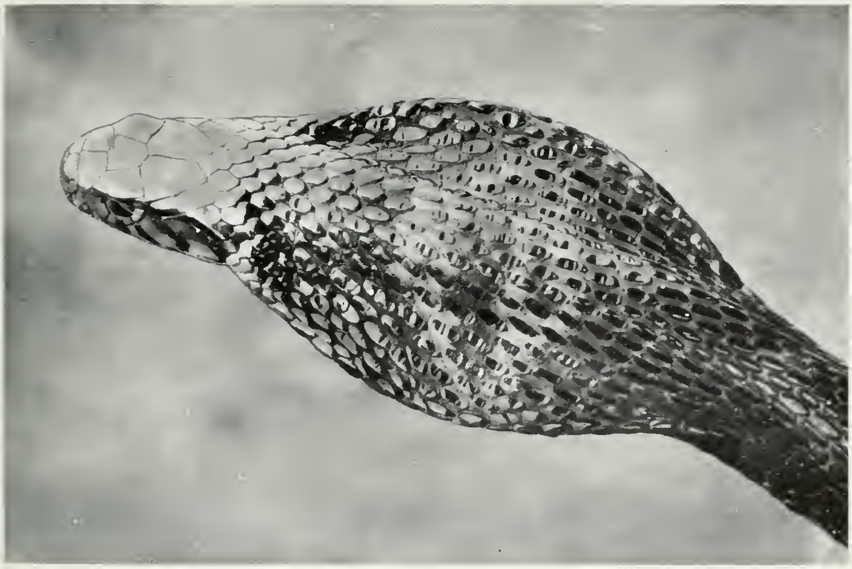


PLATE XVI

Fig. 1. *Naja melanoleuca* Hallowell. Neck distended. From dead specimen.
Fig. 2. *Naja melanoleuca* Hallowell. From dead specimen.

1



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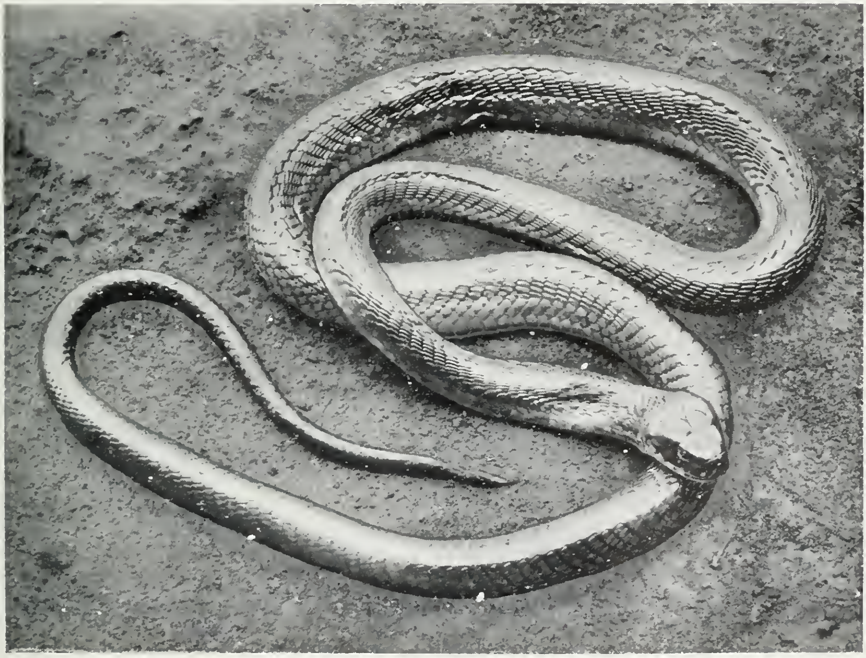
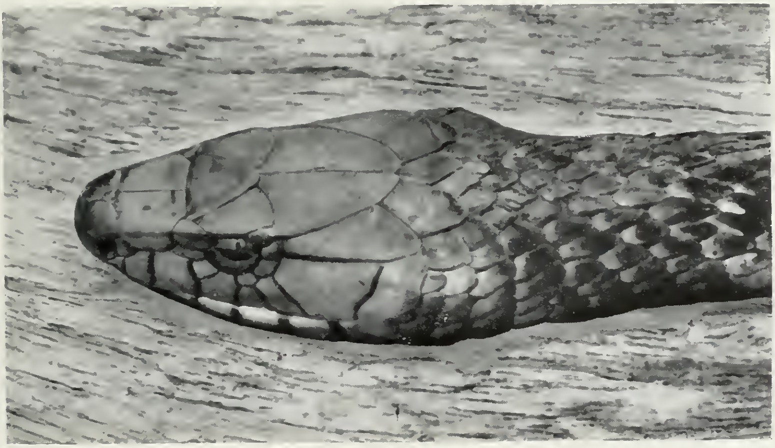


PLATE XVII

Fig. 1. *Dendraspis jamesonii* (Traill). Head. From dead specimen.
Fig. 2. *Elapops modestus* Günther.



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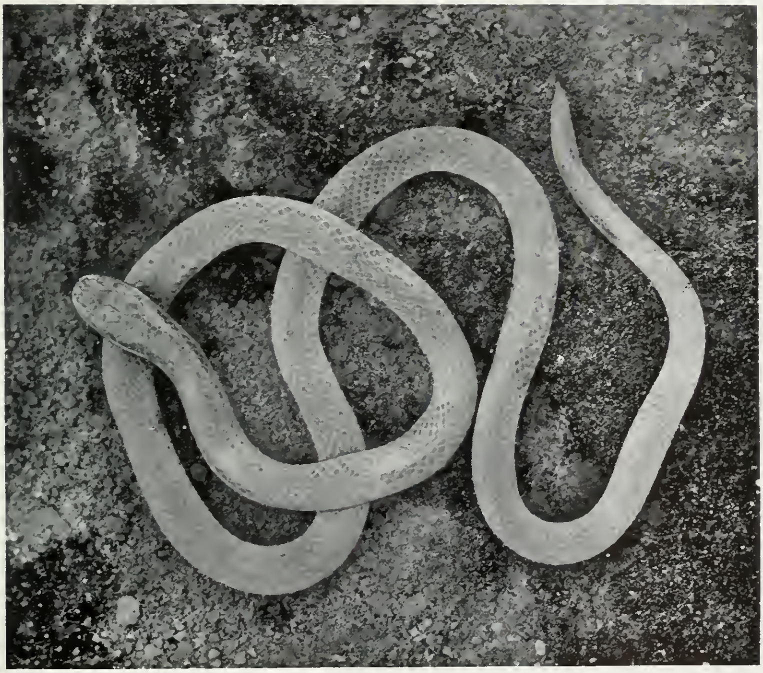

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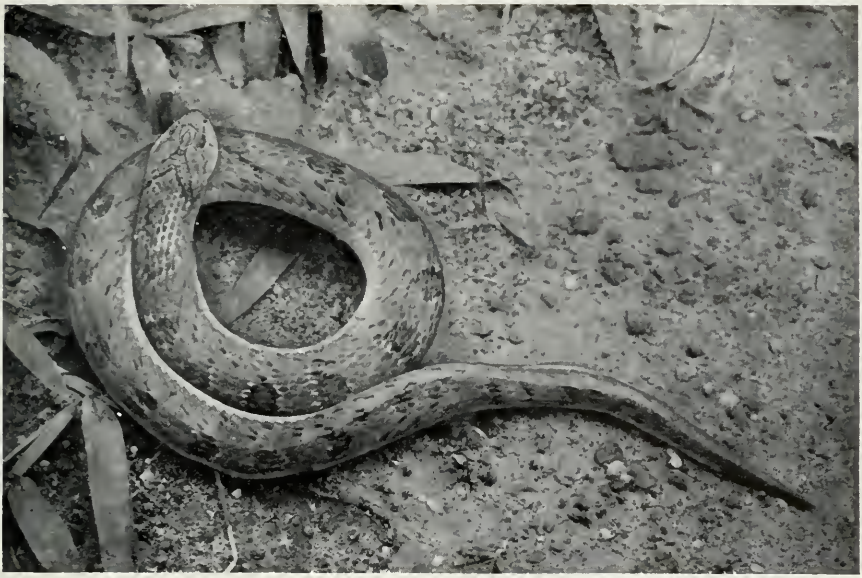
Plate XVIII

Fig. 1. *Causus rhombeatus* (Lichtenstein). From dead specimen.
Fig. 2. *Atractaspis irregularis* (Reinhardt). From dead specimen.

1



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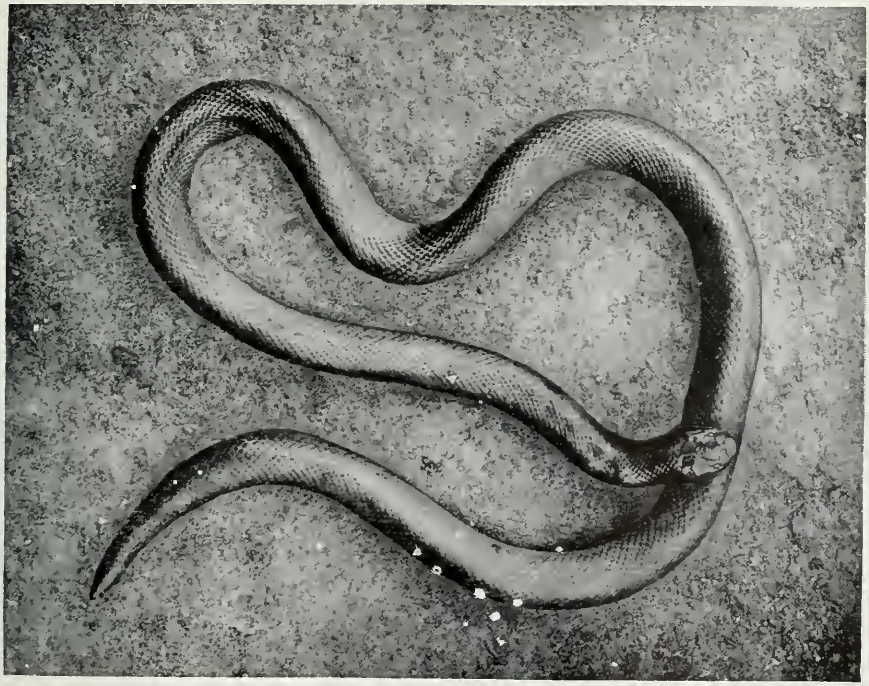
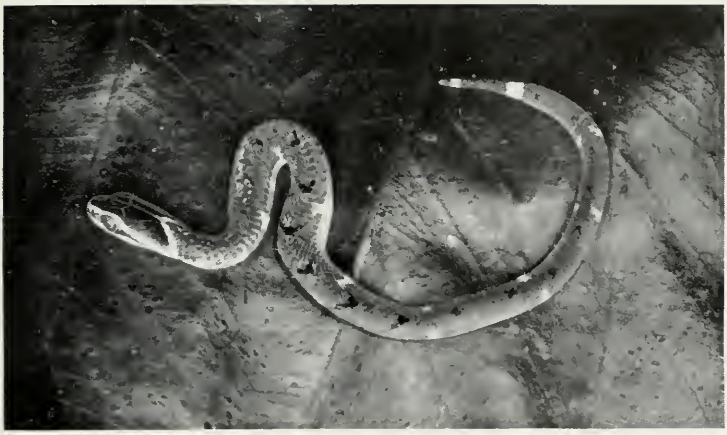


PLATE XIX

Fig. 1. *Causus lichtensteini* (Jan). Juvenile coloration. From life.

Fig. 2. *Causus lichtensteini* (Jan). Adult. From dead specimen.

1



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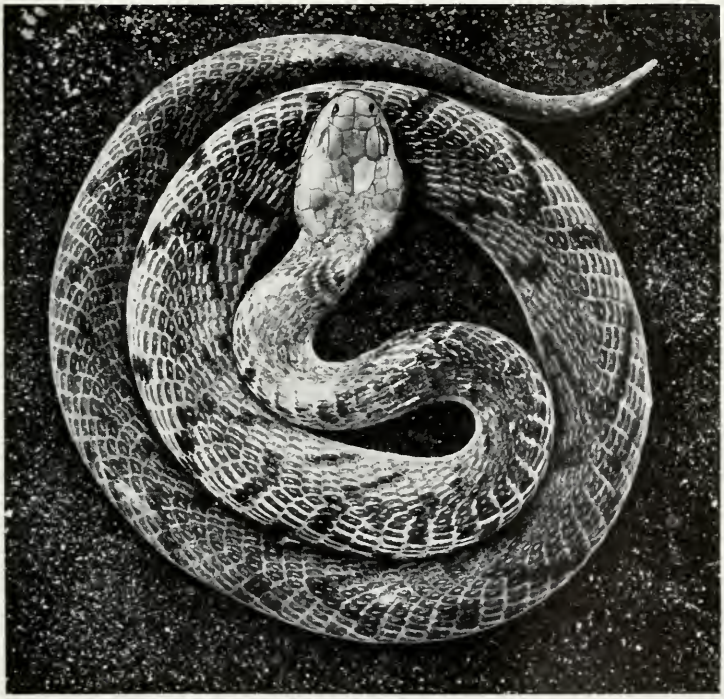
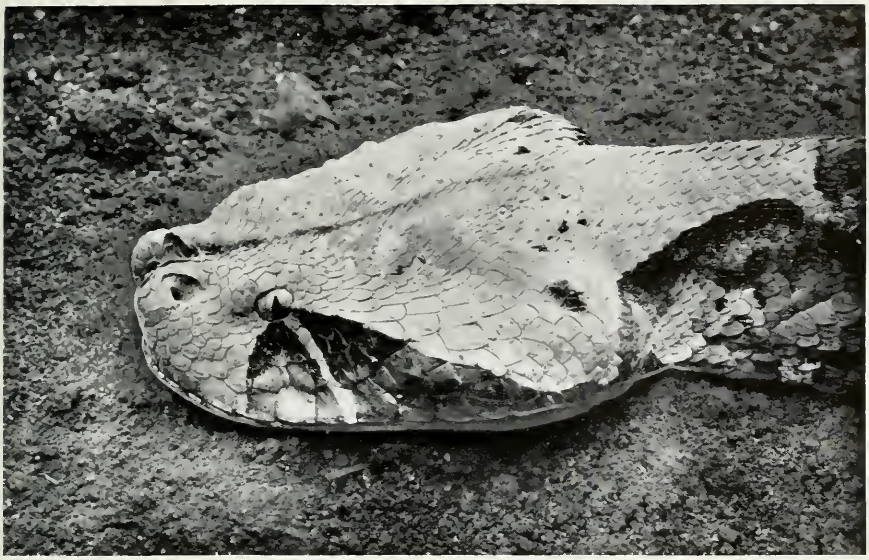


PLATE XX

Fig. 1. *Bitis gabonica* (Duméril and Bibron). Head. From dead specimen.
Fig. 2. *Bitis gabonica* (Duméril and Bibron). From life.

1



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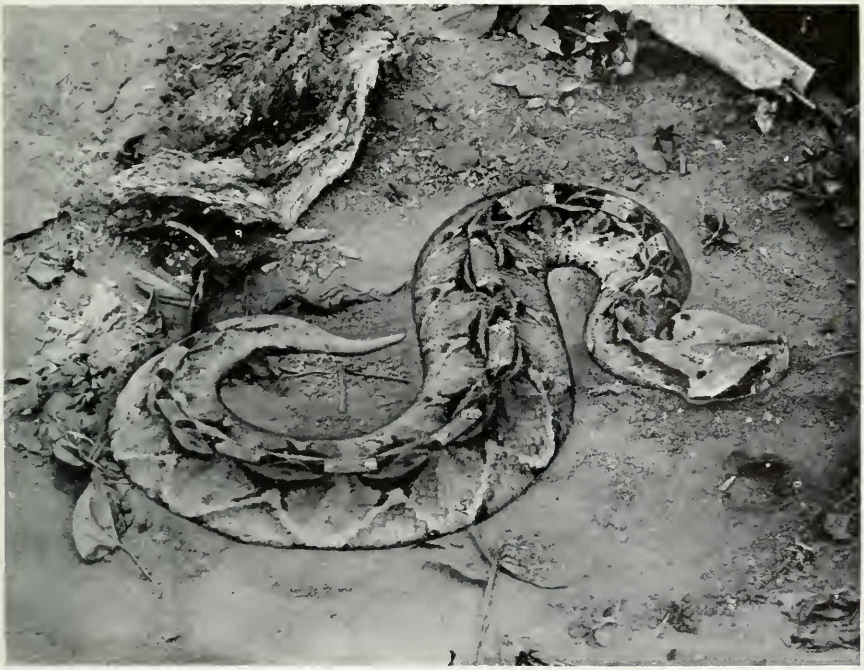
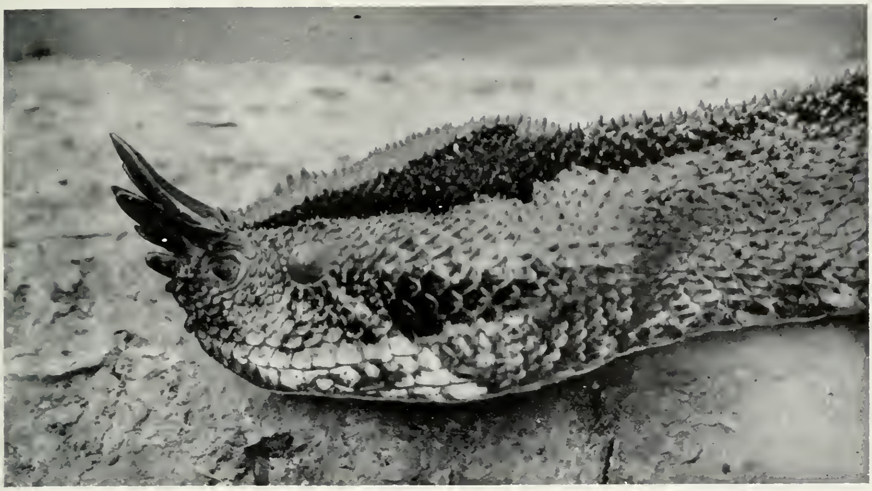


PLATE XXI

Fig. 1. *Bitis nasicornis* (Shaw). Head. From dead specimen.
Fig. 2. *Bitis nasicornis* (Shaw). From life.

1



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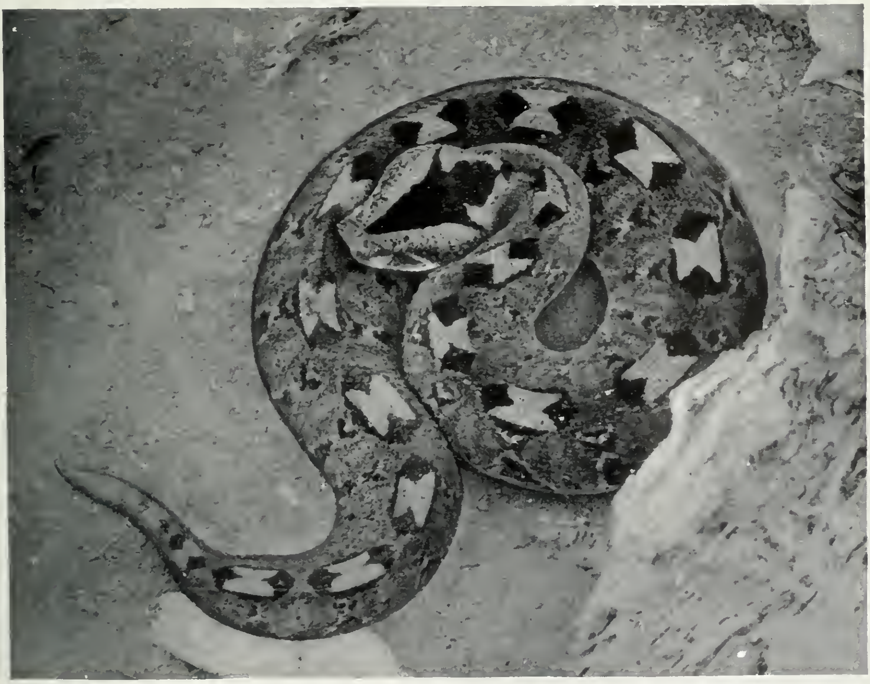
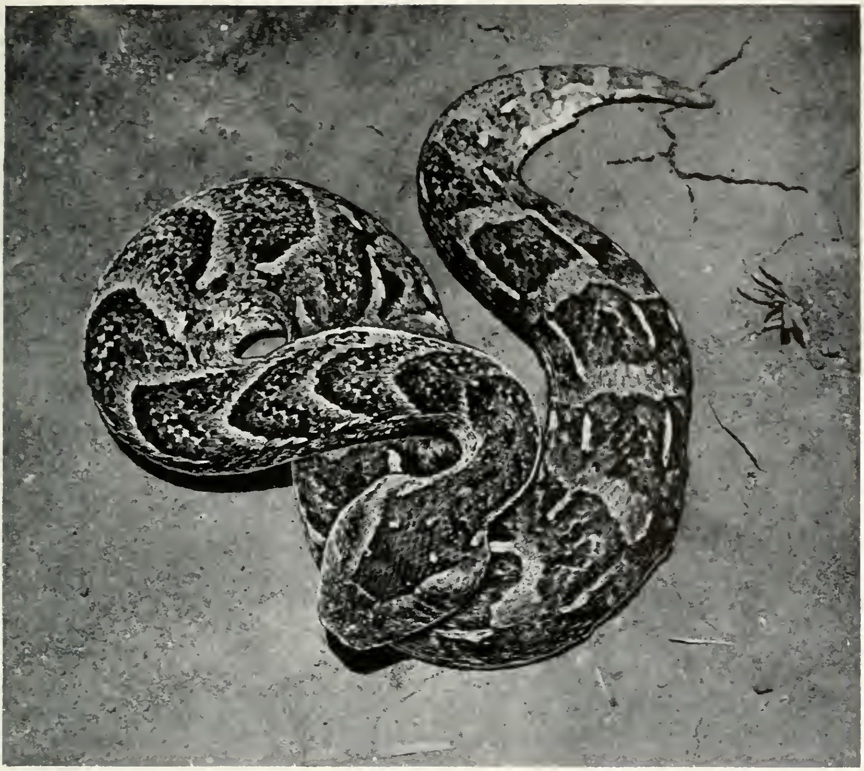


PLATE XXII

Fig. 1. *Bitis arietans* (Merrem). From dead specimen.

Fig. 2. *Atheris squamiger* (Hallowell). From dead specimen.

1



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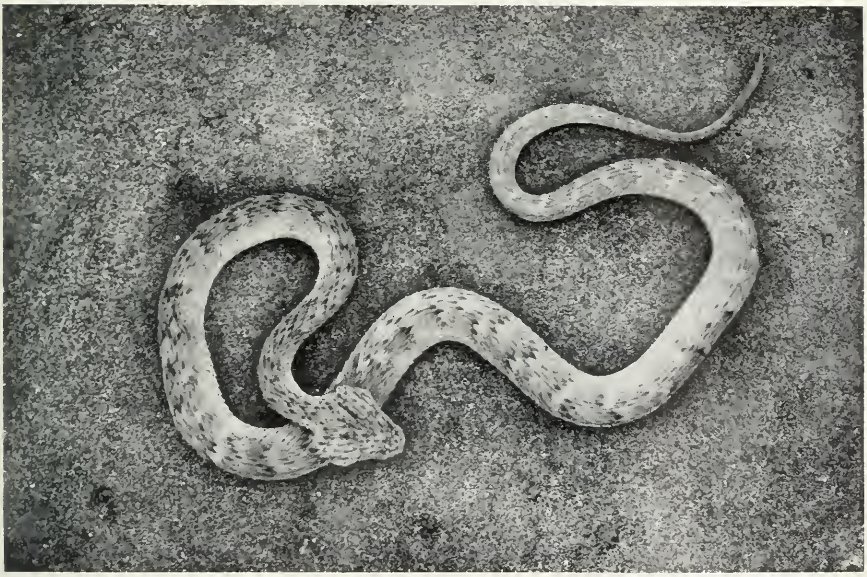

59.76(67.5)

Article II.—CONTRIBUTIONS TO THE HERPETOLOGY OF THE BELGIAN CONGO BASED ON THE COLLECTION OF THE AMERICAN MUSEUM CONGO EXPEDITION, 1909–1915[1]

PART III. AMPHIBIA

BY G. K. NOBLE

WITH ABSTRACTS FROM THE FIELD NOTES OF HERBERT LANG AND JAMES P. CHAPIN

PLATES XXIII TO XLII, 8 TEXT FIGURES

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List of the Localities from which Specimens are Recorded with Their Approximate Latitude and Longitude.... 150
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PRESENT DISTRIBUTION OF THE SALIENTIA IN AFRICA.... 151
DISCUSSION OF THE FAMILIES, GENERA, AND SPECIES REPRESENTED IN THE COLLECTION.... 154
Pipidæ.... 154
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A CHECK LIST OF THE AMPHIBIA OF AFRICA.... 304

INTRODUCTION

The Amphibia collected by the American Museum Congo Expedition number 2,170 well-preserved specimens, distributed among fifteen genera and fifty-three species. The present report following so closely on my recent paper on 'The Phylogeny of the Salientia' (Noble, 1922) considers matters of only systematic and zoögeographic interest. No comprehensive work dealing with African Amphibia has appeared since Boulenger's catalogue in 1882.[2] A glance at the appended bibliography will show that the papers dealing with African Amphibia published since that time have been extraordinarily numerous. Collections of African Amphibia are very rare in America and any report on them made in this country must be to a certain extent provisional. Much bibliographic work was required to reach any conclusions. In order that this work may not be lost I have attempted to bring together at the close of this paper a check list based on a study of the data contained in the many papers included in the bibliography. In this list I have tried to indicate the accepted opinion as to the status of the various species—an opinion not always known by recent students of African herpetology. It also gives the range of these species so far as the ranges can be deduced from the literature. The check list is modelled after that of Stejneger and Barbour on the North American Amphibia and Reptilia. It is hoped that it may serve the same useful purpose. Forms which are not included in the list are not considered valid. The synonymy has been limited to the original description, the authority for the combination, and a reference to the most important discussion of each species.

---

[1] Scientific Results of The American Museum of Natural History Congo Expedition, Herpetology, No. 3.

[2] The comprehensive volume by Nieden, 1923, 'Amphibia, Anura I,' 'Das Tierreich' (Berlin) unfortunately appeared too late to be included in this paper.

The body of the paper is devoted to a discussion of the fifty-three species represented in the Congo collection. Lack of comparative material has necessitated a very conservative opinion on many of them, especially on the species of *Hyperolius*. The synonymy under each species is intended to include references to all the literature which has appeared since Boulenger's 'Catalogue' (1882). The synonymy is therefore not complete but sufficient for distributional studies. The new *Hymenochirus* is remarkable in coming from a region which was herpetologically well known. This, together with the fact that a number of forms recorded from the Congo basin are not represented in the collection, presents further evidence of the difficulties of most herpetological collecting, work in which the Expedition was so highly successful.

Field study of Amphibia is a specialized task. In spite of the broad interests of the Expedition, much time was devoted to the careful describing of the colors of the living specimens. Abstracts made from these field descriptions form one of the more important contributions of this paper. These abstracts are included in the body of the paper, but they have been set off by quotation marks from the rest of the text. Most of these field notes were made by Mr. Lang, the leader of the Expedition. They include only information actually recorded in the field. Mr. Lang is to be heartily congratulated on these numerous and accurate notes. I am indebted to Mr. Lang for the splendid series of batrachian portraits included in the paper. The Amphibian collection was made under Mr.

Lang's personal supervision. He devoted much time and labor in bringing together the large collection discussed below.

The observations of habits recorded in the field by Mr. Lang and Mr. Chapin have been supplemented by a study of the gonads and of the stomach contents. Little is known about the breeding season of tropical frogs, but my study of their sexual organs has allowed me to infer that this season may be very irregular in the Congo basin. The work on the stomach contents was greatly facilitated by the experienced aid of Dr. J. Bequaert, who has kindly identified all the invertebrate material contained in the stomachs. The heterogeneous nature of this material, listed under the various species, gives further support to the opinion now fairly well established, that frogs and toads are rarely specialized to particular food habits. *Hemisus,* to be sure, is an "ant-eater," but a great many generalized forms live largely upon ants and termites. The presence or absence of teeth is not definitely correlated with a particular diet. The absence of teeth may, however, limit to a certain extent the variety of food secured. Thus *Bufo superciliaris,* in spite of its large size, does not seem to feed on vertebrates, while several species of *Rana,* much smaller in size, prey to a large extent upon toads or other species of Salientia. Frogs and toads seize whatever living animal food is in their vicinity.

The work on the Amphibian collection has been greatly facilitated by coöperation from many sources. I am chiefly indebted to Mr. Karl P. Schmidt and Doctor Joseph Bequaert, who have aided me with bibliographic references. Dr. Bequaert has kindly read the entire manuscript. Thanks are due to Dr. Thomas Barbour, who has placed the magnificient Cameroon collections of the Museum of Comparative Zoölogy at my disposal. I am also indebted to Dr. A. G. Ruthven of the University of Michigan for the loan of a collection of Cameroon Amphibia previously reported upon by Dr. Barbour. Mr. Henry W. Fowler has given me the opportunity of studying the African collections in the Philadelphia Academy of Sciences. In the preparation of the paper I have received advice from Dr. Stejneger of the United States National Museum and Dr. Dunn of Smith College. Many within the American Museum of Natural History have helped me materially. The microphotographs were made by Mr. Charles F. Herm, under my direction. The drawings are evidence of the skill of Mrs. Helen Ziska and Mrs. E. L. Beutenmüller.

List of Localities From Which Specimens Are Recorded With Their Approximate Latitude and Longitude

Akenge.—2° 55′ N., 26° 50′ E.
Avakubi.—1° 20′ N., 27° 40′ E.

Bafwabaka.—2° 10′ N., 27° 50′ E.
Bafwaboli.—0° 40′ N., 26° 10′ E.
Bafwamoko.—0° 40′ N., 26° 55′ E.
Bafwasende.—1° 10′ N., 27° 15′ E.
Banalia.—1° 30′ N., 25° 40′ E.
Batama.—1° N., 26° 40′ E.
Boma.—5° 50′ S., 13° 10′ E.
Boyulu.—1° N., 27° E.

Dungu.—3° 30′ N., 28° 30′ E.

Faradje.—3° 40′ N., 29° 40′ E.

Gamangui.—2° 10′ N., 27° 20′ E.
Garamba.—4° 10′ N., 29° 40′ E.

Kamumionge.—1° N., 27° 5′ E.

Leopoldville.—4° 25′ S., 15° 20′ E.
Lié.—2° N., 21° 20′ E.
Lukolela.—1° 10′ N., 17° 10′ E.

Matadi.—5° 50′ S., 13° 35′ E.
Medje.—2° 25′ N., 27° 30′ E.
Mobeka.—2° N., 19° 50′ E.

Nala.—2° 50′ N., 27° 50′ N.
(Nepoko River (Gamangui).—2° 10′ N., 27° 20′ E.
Ngayu.—1° 40′ N., 27° 40′ E.
Niangara.—3° 40′ N., 27° 50′ E.
Niapu.—2° 15′ N., 26° 50′ E.

Poko.—3° 10′ N., 26° 50′ E.

Rungu.—3° N., 28° E.

Stanleyville.—0° 30′ N., 25° 15′ E.

Thysville.—5° 30′ S., 15° E.

Ukaturaka.—2° N., 20° 30′ E.

Vankerckhovenville.—3° 20′ N., 29° 20′ E.

Yakuluku.—4° 20′ N., 28° 50′ E.

Zambi.—6° S., 12° 50′ E.

ORIGIN AND AFFINITIES OF THE AFRICAN SALIENTIA

The origin of the African Amphibia has been so recently discussed by me (Noble, 1922, pp. 64–67) that little need be added at this time. The few papers which have appeared since my earlier paper went to press tend to confirm my conclusions, namely, that the amphibian fauna of Africa gained access to that continent from the North and that no land bridges need be postulated to account for the presence of the pipids, hylids or bufonids (cystignathids) or any other groups of Amphibia found there today. The evidence for this opinion is given in the paper mentioned and need not be repeated here.

The fauna of Madagascar was derived at some early period from that of Africa. Most of the Salientia found in Africa today are either recent immigrants from the North or have been derived from African stocks. Only two African genera are found today in Madagascar. I assumed three in my earlier paper, but it has been shown by Witte (1921, p. 14, footnote) that *Arthroleptis horridus* of Madagascar is not congeneric with the African forms.

The recent discovery of a urodele by Chabanaud (1921, p. 139) south of the Sahara in no way alters my earlier conclusions. This species, now referred to *Molge waltl* (Angel, 1921, p. 736), was found in the Niger drainage. The discovery merely lends further support to the conclusions reached from geological evidence that the Niger at one time flowed to the north, emptying either into the "Sahara Sea" or into the Mediterranean.

PRESENT DISTRIBUTION OF THE SALIENTIA IN AFRICA

A study of the check list at the close of this paper will make clear how difficult it is to give any statement as to faunal areas. The Ethiopian region is clearly marked off from the Mediterranean and is nearly as distinct from the Mascarene but, except for the strikingly different forest and savannah provinces, no well-marked divisions of the continent south of the Sahara may be made. Schmidt, in his critical review of the distribution of the African reptiles (Parts I and II of this series of papers), has found good reason for proposing a number of subprovinces. The distribution of the Amphibia does not conform to these areas. Certain little-known species are often confined to one or another of them, but so many exceptions occur, so many species range through parts of two or three of these hypothetical faunal areas, that they have little importance in our discussion.

The forest fauna is, of course, very different from that of the savannah. Further, the fauna of the Cameroon-Gaboon area supports many more indigenous genera than any other region of similar size in Africa. If we were to divide the Ethiopian region into faunal provinces, the Cameroon-Gaboon area would be one of our primary divisions. The discrepancy between the conditions found in the reptiles and in the amphibians probably lies in the fact that many amphibians are local in their distribution, often known only from their type localities, while the distribution of the reptiles, as that of the mammals, seems to be chiefly dependent on the climatic and vegetation zones. Vegetation, but chiefly hydrographic conditions, doubtlessly has considerable effect on the distribution of the Amphibia but, after a study of the data at hand, it seems premature to make any definite statement as to faunal zones.

The distribution of the genera of frogs and toads south of the Sahara has been represented diagrammatically in the accompanying graph. It will be noted that the Cameroon-Gaboon region supports more than twice as many genera as the combined regions visited by the Expedition. This is the more significant in that the latter regions embrace together much more territory than the former.

In the map I have indicated the areas considered. A cursory glance at the check list at the close of this paper will show that these areas can hardly be called faunal zones. But they are more nearly faunal zones than any other regions which could be indicated. Areas 2, 8, and 10 have apparently been centers of generic differentiation, while 7 and 9 have been migration routes for many species. Area 6 is chiefly characterized by the presence of many species at present not known from 5, which is climatically very similar to 6. Area 1, although forested as 2, lacks many of the genera found there. Area 4 is a forest outlyer with an amphibian fauna composed of a mixture from areas 3 and 9. The similarity of areas 4 and 3 suggests that the forests of the Upper Congo may have extended to the east coast, but the much richer fauna of area 2 leads one to suspect that the Cameroon-Gaboon region has fostered amphibian specialization longer than any other single region.

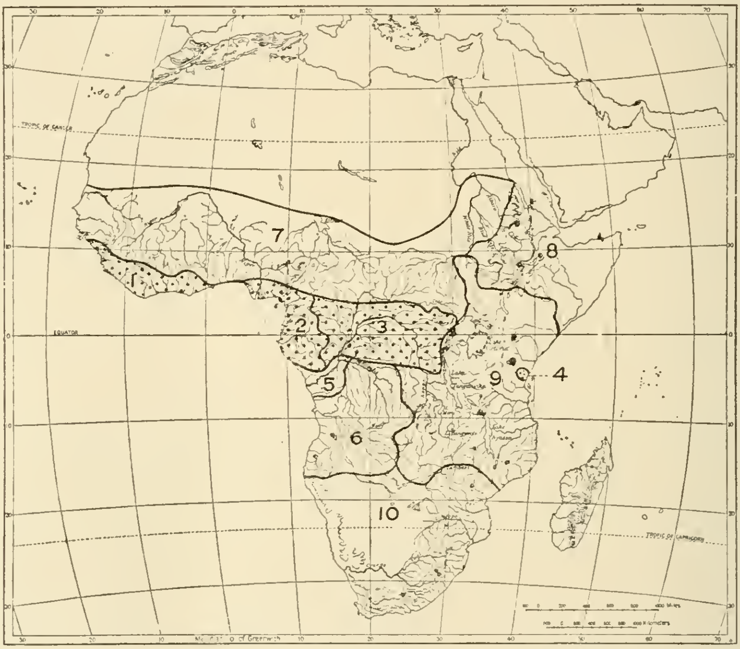
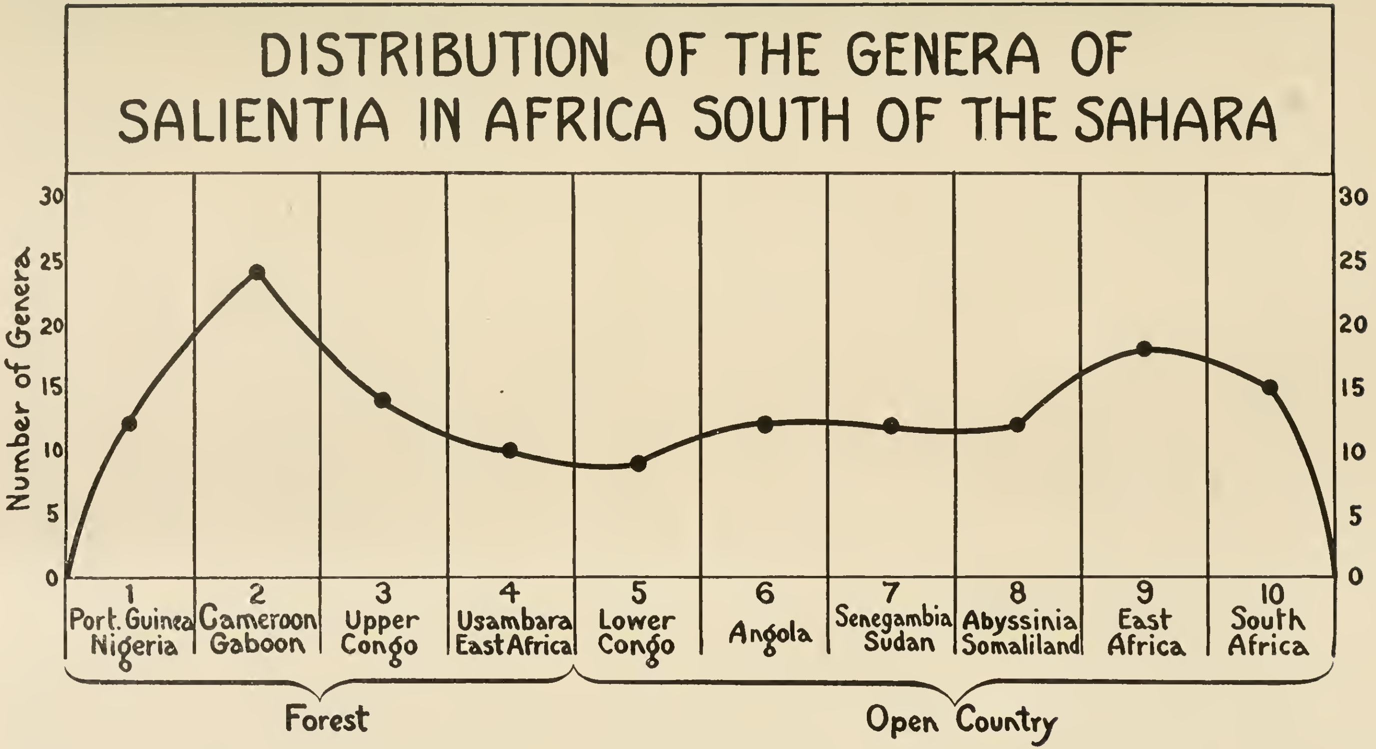


Fig. 1. Africa, subdivided into convenient areas for distributional discussion. For explanation, see opposite page.

The fact that I have been unable to distinguish well-defined or even poorly defined faunal zones suggests that such zones do not exist. The factors which control the distribution of one group of animals do not necessarily control the distribution of another. Isotherms do not limit the distribution of most African Amphibia. Humidity must play a part,



DISTRIBUTION OF THE GENERA OF SALIENTIA IN AFRICA SOUTH OF THE SAHARA but whether it plays a very important part is uncertain. Most Amphibia have specialized breeding habits. They breed in only certain types of streams, ponds, or on land in situations of certain humidity. The distribution of Salientia during the breeding season may be dependent on the presence of these situations. Salientia do not migrate great distances. Their distribution during the entire season may be dependent on the occurrence of these breeding habitats.

The species of African Amphibia are comparatively well known, but the breeding of these species remains, with a few exceptions, entirely unknown. If the exact habitat and breeding site of even a fair proportion of the species listed in the appended Check List were known, I feel that there would be little difficulty in determining the chief factors which control the distribution of African Amphibia. Food habits of the Salientia are rarely circumscribed. Large areas of Africa have much the same temperature. If food and temperature do not play an important part in controlling distribution, it is probable that humidity and breeding sites may be of more importance than usually conceded. Before any sound conclusions may be reached, much more must be known of the exact conditions under which Amphibia live and breed.

DISCUSSION OF THE FAMILIES, GENERA, AND SPECIES REPRESENTED IN THE COLLECTION

Pipidæ

Two of the three genera of African aglossal frogs parallel each other in having certain species restricted to the forest and others to the open country. *Hymenochirus boettgeri*, *H. feæ*, and *Xenopus tropicalis* are the forest forms, while *H. curtipes*, *Xenopus clivii*, *X. mülleri*, and *X. lævis* are the open country species. It is noteworthy that, while *X. clivii* is restricted to the northeastern faunal area, the other three of the second group are not characteristic of any one definite faunal province as is the case of so many species of reptiles.

The recently described *Pseudhymenochirus*, is known only from the type species secured near Conakry, French Guinea.

HYMENOCHIRUS Boulenger

The Congo Expedition secured a species of this genus which is very distinct from the two species formerly known. The three species now included in the genus are readily distinguishable by their different leg length and by the different extent of the webbing between the digits.

Hymenochirus curtipes, new species

Plate XXIII; Text Figure 2

Three specimens from Zambi, Lower Congo, June 1915, A. M. N. H. Nos. 9453–9455.

Distribution.—While the species is known only from Zambi, it is assumed that its range embraces more or less of the Lower Congo.

Diagnostic Characters.—Leg-length much shorter than in the other species of *Hymenochirus;* tibiotarsal articulation barely reaching the shoulder; tibia contained nearly three times in the head and body length. Fingers half webbed, toes completely webbed, the webs scarcely indented. Tubercles of the sides of the body not distinctly enlarged, only a little larger than those of the back.

Type.—A. M. N. H. No. 9453, adult ♂, from Zambi, June 1915.

Description of Type Specimen.—Head narrow, flat, without any indication of a canthus rostralis; snout subtruncate, the nostrils terminal; eye directed nearly dorsally, its greatest diameter contained one and a third times into the distance between its anterior end and the nostril; interorbital space a little less than three times the greatest diameter of the eye; no tympanum; no upper eyelid. Fingers about half webbed, the web scarcely indented; one (of inner digit), one, two and two phalanges of the respective fingers free; toes webbed to the base of each of the terminal phalanges, the web slightly more indented than that of the fingers. Tibiotarsal articulation nearly reaching the shoulder; the tibia contained in the head and body length a trifle less than three times; a prominent inner metatarsal tubercle, without horny sheath. Skin coarsely and uniformly tubercular, the tubercles of the sides of the body and hinder surfaces of the thighs a trifle larger than those of the back.

Muddy brown above, indistinctly spotted with dark brown above, distinctly below.

Measurements

Snout to Vent	24	mm.
Width of Head	5.5	mm.
Foreleg	9	"
Hind leg (vent to tip of longest toe)	24	"
Tibia	8	"

Relations.—I am not at all convinced that the Cameroon-Gaboon specimens of *H. boettgeri* which Boulenger (1899, p. 122) has considered indistinguishable from the type as described are really identical with it. There is considerable discrepancy in leg-length and rugosity between them and the original description. Still our specimens of *H. curtipes* differ so greatly from both the original description of *H. boettgeri* and the Cameroon specimens available to me that they cannot be confused with either. I have examined three Cameroon specimens referred by Boulenger to *H. boettgeri,* one (M. C. Z. 2468) thirty-three millimeters in length from the Ja River, another (M. C. Z. 2469) twenty-seven millimeters in length from Kribi, and the third (M. C. Z. 2462) twenty-five millimeters long, from north Cameroon. Whether or not these specimens are identical with *H. boettgeri* it is impossible to say without an examination of the type. They are, nevertheless, conspicuously different from *H. curtipes* in their much greater leg-length, enlarged lateral tubercles, broad heads and indented webbing of the digits. The tibia of these specimens is contained into their head and body length from two and one-fifth to two and one-third times. Their tibiotarsal articulation just reaches or nearly reaches the eye. Tornier (1896, p. 163) states in his original description of *H. boettgeri* that it is the tarso-metatarsal joint which just reaches the eye. In our specimens of *H. curtipes* the tarso-metatarsal articulation extends at most only a little beyond the shoulder. It is apparent that, regardless of the status of the Cameroon specimens, *H. curtipes* is very different from *H. boettgeri.*

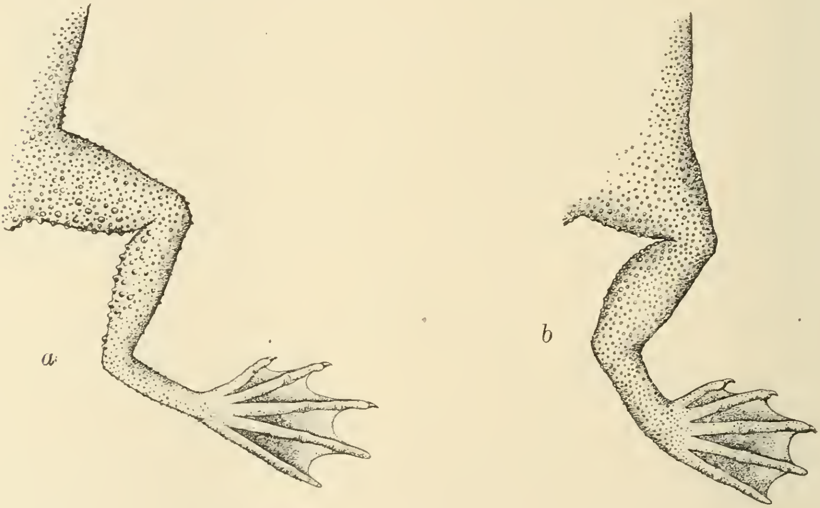


Fig. 2. (*a*) *Hymenochirus boettgeri,* (Tornier) and (*b*) *Hymenochirus curtipes,* new species. Comparison of the right hind limbs, dorsal aspect.

Boulenger (1906, p. 158) states that *H. feæ* is very similar to *H. boettgeri,* "agreeing with it in every respect except that the fingers and toes are fully webbed to the tips." But, to judge from Boulenger's figure (idem, Pl. I, fig. 1), it would seem that *H. feæ* is also different from *H. boettgeri* and like *H. curtipes* in lacking the greatly enlarged tubercles of the sides of the body which, although not shown in Tornier's figure of *H. boettgeri,* are very distinct in the Cameroon specimens that I have examined.

VARIATION.—The three specimens of *H. curtipes* in our series measure 28, 26, and 24 mm. from snout to vent. There is no variation in color, and practically none in proportions.

XENOPUS Wagler

Only four species of *Xenopus* are actually recognizable. These may be distinguished by the following key.

a_1.—Metatarsal tubercle provided with a black claw.
  b_1.—Tentacle much shorter than half the length of the eye............*X. clivii.*
  b_2.—Tentacle about half the diameter of the eye...............*X. tropicalis.*
a_2.—Metatarsal tubercle naked.
  b_1.—Tentacle much shorter than half the diameter of the eye; metatarsal tubercle weak, blunt..................................*X. lævis.*
  b_2.—Tentacle about half the diameter of the eye; metatarsal tubercle prominent, pointed....................................*X. mülleri.*

Xenopus mülleri (Peters)

Plate XXIV

Dactylethra mülleri PETERS, 1844, Monatsber. Akad. Wiss. Berlin, p. 37 (type locality: Mozambique).

Xenopus muelleri BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 457 (part: Zanzibar). PETERS, 1882, 'Reise nach Mossambique,' III, p. 180, Pl. XXV, fig. 3, Pl. XXVI, fig. 12 (Zanzibar and Mozambique: Cabaçeira, Boror, Tette, Sena, Mesuril and Quilimane). PFEFFER, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 12 (Zanzibar and Kingani, East Africa). BOETTGER, 1892, 'Cat. Batr. Mus. Senck.,' p. 51 (Mozambique). PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 104 (Zanzibar and Kingani, East Africa). BOULENGER, 1895, Proc. Zoöl. Soc. London, p. 540 (Murgen, Western Somaliland). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 27 (Mozambique: six localities). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 162 (Zanzibar and German East Africa: Tanga, Dar-es-Salaam, Irangi, Kakomo, Kawendi and Bukoba). BOULENGER, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland: N. W. Nyasa, Nyika Plateau and Fort Hill, Masuka District). JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a*. TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa); 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 300 (German East Africa). BOULENGER, 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Moero). NICKEL, 1901, Helios, XVIII, p. 72 (German East Africa). BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 409 (British East Africa: Atchi on Mount Kouyou). SCHERER, 1903, Blätter Aquar. Terrarien kunde, XIV, p. 61 (German East Africa). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1907 (Sudan: Gondokoro). KRAFT, 1910, Blätter Aquar. Terrarien kunde, XXI, p. 642 (Africa). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 27 (Tanga, German East Africa). HEWITT, 1911, Rec. Albany Mus., II, part 3, p. 228 (Mozambique, Nyasaland and Zanzibar). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 178 (East Africa and the Sudan). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 344, 347, 357 and 367 (East Africa: Mikindani, Kenia, and Zanzibar). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 387 (German East Africa: nine localities; British East Africa: four localities; Portuguese East Africa: one locality). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Agouagon, Dahomey).

Eighty-nine adults and ninety-five tadpoles: sixty-two of the former from Faradje, October 1912; twelve from the same locality January 1913 and nine, February 1911; five from Niangara, June 1913, and one from the same locality, November 1910; all of the tadpoles from Faradje, October 1912. (A. M. N. H. Nos. 9456–9546.)

DISTRIBUTION.—*Xenopus mülleri* has a wide range throughout the Sudan and East Africa from Gondokoro in the north to Tette in the south. The locality records of the Congo Expedition show that this range extends considerably east in the Sudanese savannahs but is abruptly limited by the forest a little farther south.

RELATIONS.—*X. mülleri* has been confused with *X. lævis* by various authors and it is impossible to state at the present time just how far the range of these two species overlap in East Africa. Boulenger (1905*b*, p. 249) has summed up the problem and our material does not permit further discussion since none of our specimens are intermediate between the two species. Andersson (1905, p. 29) referred some badly preserved specimens of *X. clivii* from Cameroon to this species but was later corrected by Nieden (1908*a*, p. 510). No specimens of *X. clivii* are available for study. It has been recorded from only Eritrea, Abyssinia, and Cameroon. This distribution is remarkable, for it seems impossible that the same species should occur locally in two such widely separated localities. *X. clivii* requires careful comparison with *X. tropicalis* more than with *X. mülleri.* The naked metatarsal tubercle, much longer than in *X. lævis*, seems to be the most diagnostic character of *X. mülleri.*

VARIATION.—Practically all the specimens which have just metamorphosed are distinctly spotted above, the spots, often irregular in outline, forming three to seven irregular longitudinal rows. In fully adult specimens these spots are visible in only those which are not darkened. The darkening may be due in part to preservation, for the majority of the adults were described in the field as "greenish gray, or brownish green above, with many irregular spots; the lateral-line structures pale yellowish; sides of the body yellowish; throat yellow and abdomen whitish; under surface of the thighs reddish. Iris bronzy with a very fine golden ring about the round pupil."

I can find no important difference between the tadpole of *X. mülleri* and that of *X. lævis* as described and figured by Bles (1905, Pl. XLI, figs. 22–24). It is, however, important to note that none of our series of ninety-five tadpoles show any indication of a branching of the tentacles so well described in *X. lævis* by Bles (*loc. cit.*, p. 814, text figs. *A*, *B*, *C*, and *D*).

Habits.—All of the specimens were taken in waterholes, often only a few yards in diameter. When the smaller waterholes were bailed out, the frogs secreted themselves in the mud.

Our series of tadpoles, although nearly all taken at one time, are in most of the stages of development, the smallest measuring 32 mm. and the largest 87 mm. It is, therefore, evident that the breeding season is rather extended at any one locality.

In view of the very detailed observations (cf. especially Bles, 1905) as to the feeding habits of the tadpoles of *X. lævis*, any information as to the food of *X. mülleri* should be of value. I have examined the alimentary tract of a number of our tadpoles. These specimens were in various stages of development, ranging from 53 to 85 mm. in total length. In none of them did I find any small Crustacea. The alimentary tracts were packed tightly with a green material which consisted solely of algæ. Diatoms were very abundant, but unidentifiable green fragments formed the larger percentage of the mass.

Six specimens which had just lost their tails had their stomachs full of small worm-like, dipterous (?) larvæ. The stomachs of the fully adult specimens contained a more varied diet. Six small tadpoles of *Xenopus*, presumably the same species, were found in the stomachs of the six specimens examined. The stomach contents of these six specimens included also 12 termites, 2 beetles, 1 ant, 1 homopterous bug, and a small amount of mud.

Morphological Note.—I have compared various stages in the development of the vertebral column in *X. mülleri* with the admirable account given by Ridewood for *X. lævis*. I find that the two species agree in all essential particulars except that the hypochordal cartilage is exceedingly thin and only distinguishable from the notochordal sheath when the latter is dissected free. It is not visible under the ordinary binocular nor in the microphotographs reproduced on Plate XXIV. I have not been able to compare my preparations directly with *X. lævis* but, judging from Ridewood's description and figures, the conditions in *X. mülleri* differ considerably from those of *X. lævis* and approach those of *Pipa* in that the hypochordal cartilage is reduced.

Another difference, to judge from Ridewood's description, is that the centra in *X. mülleri*, like the neural arches, begin to ossify from two centers and only in tadpoles which have well-developed appendages do these two parts unite to form the horizontal epichordal series of plates which Ridewood describes.

Xenopus tropicalis (Gray)

Silurana tropicalis Gray, 1864, Ann. Mag. Nat. Hist., (3) XIV, p. 315 (Type locality: Lagos, West Africa); Proc. Zoöl. Soc. London, p. 458 (Lagos).

Xenopus (*Dactylethra*) *calcaratus* Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 200 (Victoria, Cameroon).

Xenopus calcaratus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 458 (Lagos, West Africa). Müller, 1885, Verh. Naturf. Ges. Basel, VII, p. 674 (Tumbo Island, Büttikofer, 1890, 'Reisebilder aus Liberia,' II, pp. 444 and 478 (Liberia). Matschie, 1893, Mitt. Deutschen Schutzgebieten, VI, p. 214 (Togo). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 434 ("West Africa, from Liberia to the Congo"); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 61 (Cape St. John, Spanish Guinea). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 29 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 157 (French Congo: Fernand Vaz, N'Djole; Portuguese Guinea: Bolama; and Fernando Po). Johnston, 1906, 'Liberia,' II, p. 833 (Liberia). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 510 (Cameroon: Assindinge, Bipindi and Duala); 1910, Arch. Naturg., LXXVI, part 1, p. 246 (Sadsche, Cameroon); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 69, figs. 149–150 (Cameroon localities of Nieden 1908; in addition, Makomo, Spanish Guinea). Despax, 1911, in Cottes, 'Mission Cottes au Sud-Cameroun,' p. 242 (French Congo). Werner, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 179 (West Africa). Boulenger, E. G., 1914, 'Reptiles and Batrachians,' p. 243 (West Africa). Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 449 (N'Zerekoré French Guianea and Samikolé Liberia).

Xenopus mülleri Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 29 (Cameroon). (Not of Peters.)

Xenopus fraseri Boulenger, 1905, Proc. Zoöl. Soc. London, II, p. 250 ("West Africa"). Werner, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 180 (West Africa). Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 2 (Belgian Congo: Avakubi, Boga and Medje).

Xenopus tropicalis Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., XIV, p. 223 (Cameroon: Isongo and Mowange).

Two hundred and sixty-five specimens, all adult: one hundred and eighty-eight from Niapu, January 1914; three from the same locality, November 1913; eighteen from Medje, June 1914, one, July 1914, and nine, March 1910; eighteen from Avakubi, January 1914, one, February 1914, and one, October 1909; nineteen from Ngayu, December 1909; seven from Rungu, July 1913; and one from Banalia, September 1914.

Distribution.—*X. tropicalis* is confined to the Rain Forest. Our specimens from Rungu were collected at the limits of the Rain Forest. Boulenger (1919) has recorded the species from the extreme eastern end of the Ituri. The species is apparently not rare throughout the forest.

Relations.—Our series of specimens, especially the large number from Niapu, exhibit such a range of variation that there can be no doubt that *X. fraseri* is identical with *X. tropicalis.* Boulenger (1919) distinguishes the two by the difference of half a millimeter in the diameter of the eye and the same in the length of the tentacle. I find in our series that the large eye is not always associated with a long tubercle. In specimens of the same size, from the same locality, and identical even to the peculiar pale dorsal and occipital stripe, I find a variation of over a millimeter in the diameter of the eye and of slightly more than two millimeters in the length of the tentacles. The extremes are connected by every intermediate step and certainly no specific distinction may be made between them. The variation is not always constant in both tentacles or both eyes of the same specimen. For example, one specimen (No. 9791 from Avakubi, January 1914) has both eyes approximately 2.3 mm. in diameter but the tentacle of the right side is less than half a millimeter in length, while of the left side it is slightly over a millimeter in length.

X. clivii is apparently different from *X. tropicalis* in its constantly shorter tentacle and larger size. I strongly suspect that the specimens from Cameroon referred by Nieden (1908*a*, p. 511) to the former species are actually referable to the latter.

Variation.—It has been pointed out above that there is considerable variation in the length of the tentacles and less so of the eyes. A third variable feature is the coloration. In addition to the parietal band of pale brown already commented upon by Boulenger (1903), a pale vertebral stripe, several millimeters in width, may be present. One or both of these bands may be absent and either may or may not be bordered with blackish brown. The ventral surface in some of the specimens is heavily spotted with dark brown, but in general it is uniformly yellowish, indistinctly stippled with brown on the throat. In life the patterns were the same but the ground tone above was greenish not grayish brown.

X. tropicalis averages much smaller than its Sudanese relative, *X. mülleri.* The largest specimen (No. 9809) in our series measures 56 mm. from snout to vent; the smallest (No. 9790) 20 mm. The latter, in spite of its small size, is completely formed and has no rudiment of its larval tail.

HABITS.—At Medje, *X. tropicalis* was found "abundant in the well-shaded portions of the shallow brooks which drain the forest. The frogs when disturbed would seek refuge among the roots and drowned branches of the overhanging trees bordering the pool. One of these frogs when caught dropped from its mouth a tadpole, and other tadpoles were found in its stomach."

An examination of the stomachs of eleven specimens from Niapu and Medje showed that *X. tropicalis* takes a variety of food, but mostly insects which fall into the water. The stomachs contained: 25 soldier and worker termites, 5 ants, 3 bugs, 1 beetle larva, and fragments of other insects.

Bufonidæ[1]

Five genera of bufonids occur in Africa. Three of these are representatives of a relatively ancient dispersal, since they either belong to palæogenic groups (*Nectophryne* and *Pseudophryne*) or have no close affinities to any other African genera (*Werneria* and *Heleophryne*). The fifth genus, *Bufo*, is apparently a recent arrival in Africa. The twenty-eight species of the genus in Africa form such a heterogeneous assemblage that it seems probable that representatives of the group gained access to Africa at a number of different times, though probably always by way of the north.

The relationships of *Werneria* are not at all clear. *Werneria* may have descended from the stock which gave rise to *Notaden*. It possesses more internal features in common with the Australian than with the neotropical genera of bufonids. Its peculiar tongue is almost certainly an adaptation merely parallel to that of *Rhinophrynus* and without genetic significance.

Nectophryne may not be a natural assemblage. It would apparently express the genetic relationships of the species better to unite *Nectophryne* with *Pseudophryne* as Nieden (1915, p. 383) has suggested. The form of the terminal phalanges has been the chief basis for distinguishing these two genera. It is apparent from the photographs (Plate XXVI, figs. 3, 4) of the terminal phalanges of *N. afra*, the type of the genus, and *N. guentheri* of Borneo that there is considerable variation in the form of these structures within the genus. It is also apparent that some of the terminal phalanges of *N. afra* may more properly be called simple than T-shaped. The terminal phalanges of *Pseudophryne australis* have no

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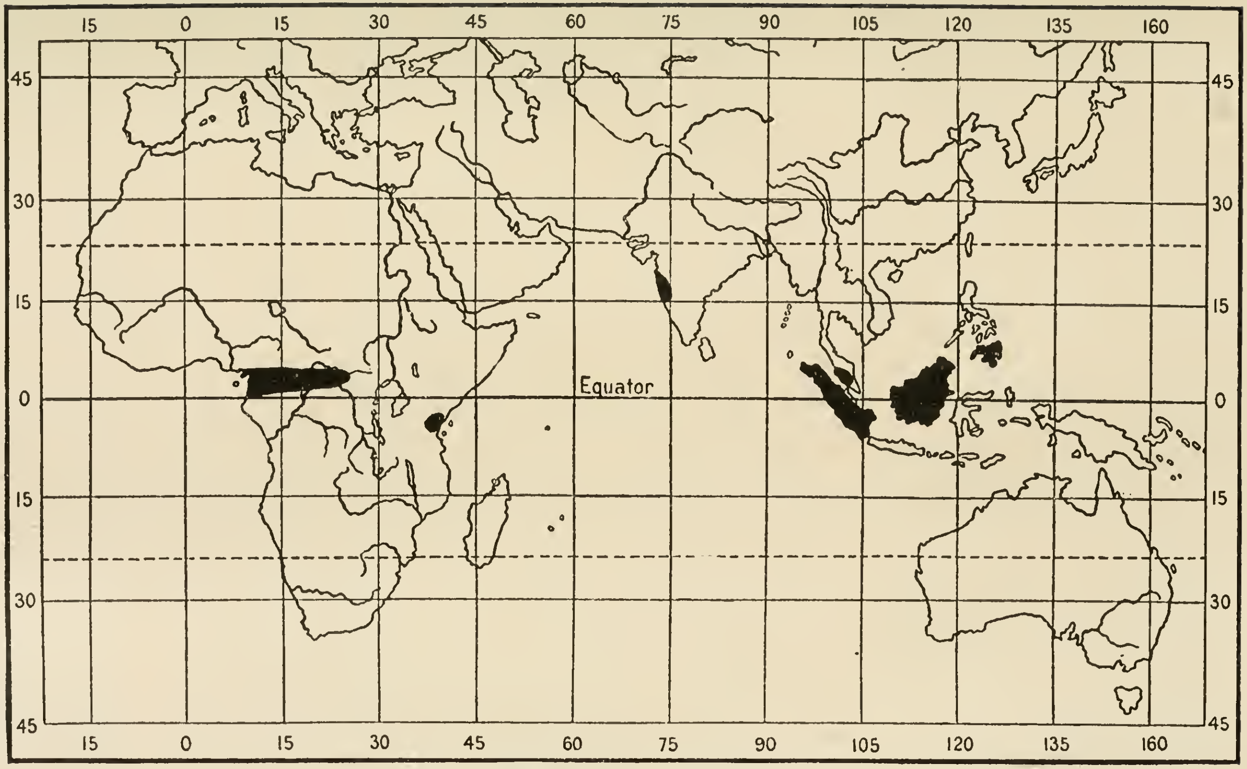
[1] For use of this name see Noble, 1922.


15
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Equator

Fig. 3. Distribution of the Genus *Nectophryne.*

indication of the terminal swelling. The range of variation in the form of the terminal phalanges is much greater within the genus *Nectophryne* than between the type species of that genus and the type species of *Pseudophryne.* Nevertheless, it does not seem advisable to unite these two genera until the internal structure of *Pseudophryne* is better understood.

Boulenger (1888, p. 188) has regarded *Pseudophryne* as a toothless *Crinia* (see discussion in Noble, 1922). In other words, *Pseudophryne* might be considered a "leptodactylid." If this opinion can be confirmed, we shall have in Africa two toothed bufonid stocks for which to account. Probably the simplest way to avoid difficulty would be to assume a northern origin for both *Pseudophryne* and *Nectophryne.*

NECTOPHRYNE Buchholz and Peters

Of the sixteen species of *Nectophryne* recognized today, only five occur in Africa. The genus reaches its maximum differentiation in Borneo, where eight species occur. *N. afra* and *N. batesii* differ remarkably from all the other species of the genus in the possession of digital lamellæ. It would be well, perhaps, to distinguish these two with a subgeneric name.

The distribution of the genus is represented in Fig. 3. It is apparent that the genus, if natural, is a palæogenic one, for its distribution is very discontinuous.

The African species of *Nectophryne* may be distinguished by the following key.

a_1.—Digits flattened, bearing transverse lamellæ below.
  b_1.—Snout projecting well beyond the mouth .... *N. afra.*
  b_2.—Snout projecting only slightly beyond the mouth .... *N. batesii.*
a_2.—Digits not bearing lamellæ below.
  b_1.—Toes only half webbed.
    c_1.—Skin tubercular above .... *N. tornieri.*
    c_2.—Skin smooth above .... *N. wertheri.*
  b_2.—Toes more than half webbed .... *N. parvipalmata.*

Nectophryne afra Buchholz and Peters

Plate XXV, Figure 1; XXVI, Figure 4

Nectophryne afra Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 202, Pl. II, fig. 5 (type locality: Cameroon). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 279 (Cameroon); 1900, Proc. Zoöl. Soc. London, II, p. 436, fig. 1 (Benito River, Gaboon); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 25 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus.

Stor. Nat. Genova, (3) II, p. 159 (Fernando Po and French Congo: Fernand Vaz and N'Kogo). ROUX, 1906, Proc. Zoöl. Soc. London, I, p. 59 (Efulen, Cameroon and the Benito River, Gaboon). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 244 (Bibundi, Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 507 (Fernando Po and Cameroon: Bipindi and Johann Albrechtshöhe). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1), Heft 2, p. 64, figs. 134–136 (Cameroon localities of Nieden 1908). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, p. 135 (Bitye, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 82 (Cameroon: Bibundi, Isongo, and Mowange). BOULENGER, 1913, Ann. Mag. Nat. Hist., (8) XII, p. 71, fig. (Spanish Guinea; Cameroon: Kribi, Alsok, Efulen, Zima Country and Bitye; Fernando Po; and southern Nigeria: Oban Hills).

One adult female, from Medje, June 1914 (A. M. N. H. No. 9451).

DISTRIBUTION.—The distribution given by Boulenger (1913) covers the range of the species as reported up to this time in the literature. Our single specimen from Medje adds another species to the list of frogs formerly known only from the Gaboon-Cameroon area but found by the expedition to occur also in the Ituri. *N. afra* will probably be shown to have a wide and uniform range throughout the Rain Forest.

RELATIONS.—*N. afra* and *N. batesii*, with their peculiar lamelliform pads on the feet, are so very different from all other species at present grouped under *Nectophryne* that they may be readily recognized. It is probable that they should be separated generically from their East Indian and East African relatives. *N. afra* is the type of the genus, and any new name proposed would not affect the species considered here.

VARIATION.—Our specimen in alcohol is a nearly uniform reddish brown above and yellowish below. In life it was "pale greenish above, fading to gray on the sides. A broad stripe of dark gray commenced at the snout and extended to just beyond the forelimb." No indication of a pattern was present such as is found in a specimen (A. M. N. H. No. 3145) of *N. afra* from the Ja River, Cameroon. The dorsal surface of this specimen is an ashy gray with two broad bands of cream-color extending along the sides. These bands are edged with brown, and a few dark spots appear on the sides below the bands.

Our specimen from Medje has perhaps attained the maximum size of the species. It is an adult female, larger than those reported by Boulenger (1913). The specimen measures 27 mm. from snout to vent and has its ovaries greatly distended with ova which measure 2.7 mm. in diameter.

Habits.—Nothing is known about the breeding habits of *N. afra* but it is assumed that they are similar to those described by Boulenger (1913) for *N. batesii.*

The stomach of our single specimen contained only 4 ants.

Nectophryne batesii Boulenger

Nectophryne batesii Boulenger, 1913, Ann. Mag. Nat. Hist., (8) XII, p. 70, fig. (Type locality: Bitye on the Ja River, Cameroon).

A single adult male from Medje, June 1914. (A. M. N. H. No. 9452).

Distribution.—The species is known only from the type series. Boulenger (1913) reported the occurrence of *N. batesii* on the Ja River in close association with *N. afra,* which it resembles very closely. The presence of both species at Medje is hardly surprising, since the Ja River forms part of the Congo River system.

Relations.—Our specimen agrees entirely with Boulenger's original description of *N. batesii* and his comparison of it with *N. afra.* The snout of our specimen is equally as blunt as that of the type. Except for Bates' field observations (cf. Boulenger, 1913) no one would suspect that the two species were distinct.

Variation.—Our single specimen of *N. batesii* is darker in alcohol than the specimen of *N. afra* from the same locality. In life it was a darker green and had a few irregular dark markings above. In alcohol the green has changed to reddish brown. Our specimen is apparently adult. It is a male, 22 mm. in length from snout to vent.

Habits.—The observations of Bates upon the breeding habits of this species, reported upon by Boulenger (1913), form an interesting contribution to the life histories of batrachians.

The species is an ant-eater. The stomach of our specimen contained only 5 ants.

Bufo Laurenti

The nearly world-wide distribution of the genus *Bufo* (absent from Madagascar, Polynesia, and New Zealand) has been commented upon by many writers. Pfeffer (1905, p. 429) has suggested that *Bufo* may be a relatively recent but aggressive member of an otherwise old family. The absence of *Bufo* from Madagascar seems to support the opinion that the genus did not gain access to Africa until comparatively recent times, but considerable evidence is given in my earlier paper (Noble, 1922) to show that the family Bufonidæ as a whole is a derived and unnatural one.

Although more than one hundred and thirty species of *Bufo* are generally recognized, only twenty-eight occur in Africa. These have a heterogeneous distribution, twenty-one species being confined to open, mostly arid regions while only seven occur in the forest. Of these seven species, five are confined to the Rain Forest. Five species are peculiar to South Africa but the other fifteen species characteristic of open country cannot be said to be definitely restricted to certain faunal areas (except for *B. mauritanicus*, *B. viridis*, and *B. vulgaris*, which are restricted to the Mediterranean region).

The African species of *Bufo* may be distinguished from one another by the following key.

a_1.—First finger shorter than second.
b_1.—Skin smooth above .... *B. preussi.*
b_2.—Skin warty above.
c_1.—Parotoid glands long, extending beyond shoulder.
d_1.—Tympanum distinct .... *B. steindachneri.*
d_2.—Tympanum absent .... *B. lönnbergi.*
c_2.—Parotoid glands not extending beyond shoulder.
d_1.—Tarsal fold present .... *B. buchneri.*
d_2.—Tarsal fold absent .... *B. vittatus.*
a_2.—First finger equal to, or longer than, second.
b_1.—Skin smooth above.
c_1.—A prominent horn over each eyelid .... *B. superciliaris.*
c_2.—No such horn over the eyelids .... *B. chevalieri.*
b_2.—Skin warty above.
c_1.—No distinct parotoid glands.
d_1.—Tympanum large, close to eye.
e_1.—A glandular lateral fold from behind the eye ...... *B. carens.*
e_2.—No glandular lateral fold .... *B. vertebralis.*
d_2.—Tympanum much smaller than eye or absent.
e_1.—Present .... *B. blanfordii.*
e_2.—Absent .... *B. chudeaui.*
c_2.—Parotoid glands more or less distinct.
d_1.—Tympanum absent.
e_1.—Snout rounded, parotoid glands small, narrow. . *B. taitanus.*
e_2.—Snout pointed, parotoid glands large, extending down sides. *B. anotis.*
d_2.—Tympanum present.
e_1.—No tarsal fold.
f_1.—Subarticular tubercle of toes simple.
g_1.—First finger much longer than second. . *B. tuberosus.*
g_2.—First finger a little longer than second. . . *B. funereus.*
f_2.—Subarticular tubercle in part double.
g_1.—First finger distinctly longer than second. *B. dombensis.*
g_2.—First and second fingers subequal.

h_1.—Toes two-thirds webbed.......... *B. vulgaris.*

h_2.—Toes one-third webbed.......... *B. fenoulheti.*

e_2.—Tarsal fold more or less distinct.

f_1.—Subarticular tubercle double........... *B. mauritanicus.*

f_2.—Subarticular tubercle single.

g_1.—Toes at least half webbed.

h_1.—Parotoids small, oval, very distinct; dorsal surface covered by scattered but very prominent tubercles.................. *B. polycercus.*

h_2.—Parotoids large, dorsal surface covered by indistinct warts.

i_1.—Tarso-metatarsal joint reaching eye or nearly as far............ *B. viridis.*

i_2.—Tarso-metatarsal joint reaching tympanum. *B. pentoni.*

g_2.—Toes less than half webbed.

h_1.—First finger longer than second.

i_1.—Flanks distinctly marked off from dorsal surface by dorso-lateral fold and by contrasting colors......... *B. brauni.*

i_2.—Flanks not distinctly marked off from dorsal surface.

j_1.—Tympanum as large or nearly as large as eye.............. *B. regularis.*

j_2.—Tympanum two-thirds the diameter of eye.................. *B. dodsoni.*

h_2.—First finger nearly equal to second.

i_1.—Snout pointed; tympanum larger than eye. *B. lemairii.*

i_2.—Snout rounded, tympanum smaller than eye.

j_1.—Tarso-metatarsal articulation not reaching beyond tympanum. *B. gariepensis.*

j_2.—Tarso-metatarsal articulation extending to eye or nearly as far. *B. angusticeps.*

Bufo regularis Reuss

Plate XXVII

Bufo regularis Reuss, 1834, Mus. Senckenberg., I, p. 60 (type locality: Egypt). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 298 (Egypt, three localities; Abyssinia, Zambezi, Gambia, Old Calabar, Carangigo, Duque de Bragança, Midian, Coast of Guinea, Sierra Leone, Cape of Good Hope, Port Elizabeth, Port Natal). Peters, 1882, 'Reise nach Mossambique,' p. 178 (Mozambique, seven localities mentioned). Vaillant, 1882, 'Faune et Flore Pays Çomalis,' p. 25 (Bender-Meraya). Fischer, 1884, Jahrb. Hamburg. Wiss. Anst., I, p. 26 (British East Africa: Naivasha Lake Region). Tristram, 1884, 'Survey of

Western Palestine,' p. 160 (Western Palestine). Vaillant, 1884, Bull. Soc. Philom. Paris, (7) VIII, p. 171 (Assini); Bull. Soc. Zool. France, IX, p. 353 (Effirou, Assini). Sauvage, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Congo). Müller, 1885, Verh. Naturf. Ges. Basel, VII, p. 671 (Gold Coast). Dollo, 1886, Bull. Mus. Roy. Hist. Nat. Belgique, IV, p. 152 (Egypt, Senegambia, Gaboon, South Africa). Parenti and Picaglia, 1886, Atti. Soc. Modena, Mem., (3) V, p. 77 (Red Sea). Bocage, 1887, Jorn. Sci. Lisboa, (1) XI, pp. 192, 208 (Angola: St. Salvador du Congo and Mossamedes). Boettger, 1887, Ber. Senck. Ges., p. 171 (Cape Town). Günther, 1888, Proc. Zoöl. Soc. London, p. 51 (Monbuttu, Upper Congo). Pfeffer, 1889 (1888), Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 12 (Mhondo, Ungúu). Boettger, 1889, Ber. Senck. Ges., p. 291 (Pondoland). Héron-Royer and Van Bambeke, 1889, Arch. Biol., IX, p. 297, Pl. xxiv, figs. 7–9 (tadpole, no locality). Schilthuis, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 286 (Boma, Congo). Boettger, 1890, 'Kat. Batr. Mus. Senck.,' p. 35 (Dahalak Island, Gaboon, Egypt, Abyssinia). Büttikofer, 1890, 'Reisebilder aus Liberia,' II, pp. 444 and 478 (Liberia). Müller, 1890, Verh. Naturf. Ges. Basel, VIII, pp. 258 and 689 (Tumbo and Cape Colony). Günther, 1892, Proc. Zoöl. Soc. London, p. 555 (Shiré Plateau, British Central Africa). Matschie, 1892, Sitzber. Ges. Naturf. Freude Berlin, p. 110 (Usambara, German East Africa); Zool. Jahrb. (Syst.), V, p. 610 (Transvaal). Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 103 (German East Africa: Usegua, Quilimane, Mhonda). Boettger, 1893, Zool. Anz., XVI, p. 132 (Somaliland). Matschie, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 55 (reprint) (Togo). Stejneger, 1893, Proc. U. S. Nat. Mus., XVI, p. 737 (Tana River; Kilimanjaro). Trimen, 1893, in Noble, 'Illustrated Official Handbook of the Cape and South Africa,' p. 87 (South Africa). Günther, 1894, Proc. Zoöl. Soc. London, p. 88 (East Africa, vicinity of Mt. Kenia). Bocage, 1895, 'Herpétol. Angola,' p. 185 (Duque de Bragança, St. Salvador du Congo, Mossamedes, Bihé, Benguella, Pungo-Andongo, Caconda, Dombe). Boulenger, 1895, Ann. Mag. Nat. Hist., (6) XVI, p. 169 (Goolis Mts.); Proc. Zoöl. Soc. London, p. 540 (Somaliland). Günther, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 526 (Shiré Highlands; Buddu). Jeude, 1895, Notes Leyden Mus., XVI, p. 230 (Transvaal: confluence of Comati and Crocodile Rivers). Anderson, 1896, 'Herpétol. Arabia and Egypt,' p. 110 (Arabia: Median; Egypt: several localities of Anderson 1898). Bocage, 1896, Jorn. Sci. Lisboa, (2) IV, pp. 81, 96, 114, 119 (Portuguese Guinea, Mozambique, Angola, Transvaal). Boulenger, 1896, Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 554 (Saati, Chinda, Eritrea); (2) XVII, pp. 14, 22 (Dabanac, Elba, Web Valley, Dolo, Magala Umberto, Degagolla, Coromma in Gallaland; Bravia, Matagoi, Lugh, Web in Somaliland); Proc. Zoöl. Soc. London, p. 217 (Lake Abeia, Lake Stephanie). Mocquard, 1896, C. R. Soc. Philom. Paris, No. 19, p. 45 (Upper Ubangi). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 160 (German East Africa, fourteen localities). Werner, 1896, Jahrb. Ver. Magdeburg, p. 148 (Transvaal). Boulenger, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 281 (Zambi, Congo); Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 722 (Somaliland: Lugh, Badditu-Dime; Sancurar-Amarr Region); (2) XVII, p. 280 (Somali-Gallaland); Proc. Zoöl. Soc. London, p. 801 (Northern Nyasaland, five localities). Johnston, 1897, 'British Central Africa,' 1st Ed., p. 361*a*

(Nyasaland). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa); ANDERSON, 1898, 'Zoöl. Egypt.,' I, p. 353 (Egypt, nine localities). SCLATER, 1898, Ann. S. African Mus., I, p. 108 (South Africa). TORNIER, 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 303 (German East Africa). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 202 (Barombi Station; Victoria, Cameroon). BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 435 ("Whole of Africa with the exception of Barbary"); 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Mwero). STEINDACHNER, 1901, Denkschr. Akad. Wiss. Wien (math.-natur.), LXIX, p. 335 (Mekka and vicinity). BOULENGER, 1902, Proc. Zoöl. Soc. London, II, p. 15 (Mashonaland); in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). WERNER, 1902, Verh. Zool.-Bot. Ges. Wien, LII, p. 342 (Windhoek, German Southwest Africa). ANDERSSON, 1904, in Jägerskiöld, 'Res. Swed. Zool. Exp. to Egypt and the White Nile,' 1901, I, fasc. 4, p. 12 (White Nile, Mahmudia). CAMERANO, 1904, Mem. Acad. Sci. Torino, (2) LIV, p. 247 (Wadi Halfa, Sudan). PERACCA, 1904, Boll. Mus. Torino, XIX, No. 467, p. 6 (Eritrea). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107 (Angola: Duque de Bragança, Pungo Andongo, Locomi, Canhoca, Marimba, between Benguella and Bihé); Proc. Zoöl. Soc. London, II, p. 250 (South Africa: Umfolosi Station, Hluhluwe Stream, Ngoye Hills, Wakkerstroom). SCLATER, 1905, in Flint and Gilchrist, 'Science in South Africa,' p. 149 (South Africa). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Portuguese Guinea: Bolama, Bissao, Farim, Rio Cassini; French Congo: Fernand-Vaz, Lambaréné). JOHNSTON, 1906, 'Liberia,' II, p. 833 (Liberia). CALABRESI, 1906, Mointore Zool. Ital., XXVII, p. 37 (Bardera, Somaliland). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 24r4 (Part: Bibundi, Cameroon). BOULENGER, 1907, Mem. Proc. Manchester Lit. Philos. Soc., LI, part 3, No. 12, p. 4 (Northern Rhodesia: Lukashashi Rive, Petauke, Mterige River); Proc. Zoöl. Soc. London, p. 479, Pl. XXI (color) (Transvaal: Woodbush, Klein Letaba; Portuguese East Africa: Coguna, Beira). WERNER, 1906, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1907 (Gebel Sarsur on the White Nile, Khor Attar, Mongalla, Gondokor o). BOULENGER, 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands); Ann. Natal Mus., I, p. 221 (Zululand: Mseleni, Indukuduku). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 507 (Cameroon: Barombi, Kribi, Bipindi, Ossindinge, Jaunde, Garua, Deidodorf, Ngoko). ODHNER, 1908, Ark. Zool. Stockholm, IV, No. 18, p. 7 (Durban; Lake Sibayi). BOULENGER, 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 193 (Tzeghie, Abyssinia); p. 304 (Sesse Islands); CHUBB, 1909, Proc. Zoöl. Soc. London, p. 591 (Matabeleland: Bulaway, Matopos). PELLEGRIN, 1909, Bull. Soc. Zool. France, XXXIV, p. 205 (Egypt: Wadi Halfa, Singa, Rahad River, Roseires). PERACCA, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 175 (Ruwenzori). ANDERSSON, 1910, Jahrb. Nassau. Ver. Naturk., LXIII, p. 205 (Harrar, Abyssinia). BOULENGER, 1910, Ann. S. African Mus., V, p. 536 (Cape Colony, nine localities; Transvaal, three localities; Southern Rhodesia; Orange River Colony). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 26 (Kibonoto, Usambara, Tanga, Meru Steppe). MEEK, 1910, Publ. Field Mus. Zoöl., VII, No. 11, p. 404 (British East Africa: Athi Plains, Molo, Lake Elmenteita). NIEDEN, 1910, Arch. Naturg., LXXVI, Beiheft 1, p. 246

(Cameroon: Garua, Dodo, Banjo Range); 'Fauna Deutschen Kol.,' (1), Heft 2, p. 67, figs. 143 and 144 (Cameroon: Longo, Bamenda and localities of Nieden, 1908); Sitzber. Ges. Naturf. Freunde Berlin, p. 452 (Tanga, German East Africa). ROUX, 1910, Rev. Suisse Zool., XVIII, p. 102 (Uganda: German East Africa: Bukoba, Busoga, Biaramuli). WERNER, 1910, in Schultze, 'Zool. und Anthrop. Ergeb. Forschungreise im West und Zentr. Süd-Afrika,' IV, p. 291 (Kalahari, Okahandja, Cape Town). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 34 (British East Africa: Mombassa, Meruboma, Escarpment). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Cameroon; Gaboon; Angola). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169 (Uganda: Bussu, Bululo, Mbale). HEWITT, 1911, Rec. Albany Mus., II, part 3, pp. 227–228 (Transvaal; Kimberley, King William's Town, Grahamstown, Cape Town). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 219 (Monrovia, Liberia; Harrar, Abyssinia; Dehane and Tanga, Cameroon). STERNFELD, 1911, 'Fauna Deutschen Kol.,' (4) Heft 2, p. 58 (German Southwest Africa: Windhuk, Okahandja, Klein-Namaland, Kalahari). BOULENGER, 1912, Ann. Mus. Stor. Nat. Genova, (3) V, p. 332 (Abyssinia: Dolo Webi Mana). HEWITT, 1912, Rev. Albany Mus., II, part 4, p. 281 Modder River, Knysna, Oudtshoorn, Kaimans River). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 185 (Bukoba, Bwanja, Karagwe, Ussui, Ruanda shores and islands of Lake Kivu, Ruasa, Mtualen Gahama, south end of Lake Albert Edward, Beni, Bomeli, Usumbura, Uvira, northwest bank of Tanganyika, and Bugoie). PERACCA, 1912, Annuar. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 8 (Lake Bangueolo, Sekantui, Luangasci; Rhodesia). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 223 (Africa). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 349, 356, 357, 360, 362, 365 (Pemba, Lamu Island, Mikindame, Dar-es-Salam, Usambara, Kilimanjaro). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 173 (South Africa: thirteen localities). KLAPTOCZ, 1913, Zool. Jahrb. (Syst)., XXXIV, p. 289 (French Guinea: Konkoure, Mamou, Dabola). NIEDEN, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 452 (Windhuk, German Southwest Africa). WERNER, 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 719 (Port Elizabeth). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 384 (German East Africa, twenty-four localities; Portuguese East Africa, five localities; British East Africa, eleven localities). WERNER, 1915, in Michaelsen, 'Beiträge zur Kenntnis der Land und Süsswasser Fauna Deutsch-Süd-Westafrikas,' part 3, p. 371 (German Southwest Africa: Okahandja, Tsumeb, and Windhuk). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Timbuctu, French West Africa; Agouagon, Dahomey). WERNER, 1919, Denk. Akad. Wiss. Wien, XCVI, p. 452 (Anglo-Egyptian Sudan: several localities). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 420 (British and German East Africa; several localities). CHABANAUD, 1921, Bull. et. Hist. et Scient. A. O. F., p. 449, (French Guinea and Liberia).

Bufo regularis var. *spinosa* BOETTGER, 1888, Ber. Senck. Ges., p. 100 (Lower Congo: Quilu, Loango, Banana, Boma, Quanza).

Bufo pantherinus COPE, 1889, Bull. U. S. Nat. Mus., No. 34, Pl. LX. MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 137 (Nubia and Cape Ceres).

Bufo garmani MEEK, 1896, Publ. Field Mus. Zoöl., I, No. 8, p. 176 (Haili, Somaliland).

Bufo benguelensis ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 26 (Cameroon). (Not of Boulenger 1882.)

(For bibliography of this species *ante* Boulenger 1882, refer to Anderson, 1898, p. 353.)

Sixty-two specimens, six of which are immature: thirteen from Medje, March 4 and August 29, 1910, August 31, 1913, April and June 1914; eight from Stanleyville, August 4, August 21, 1909, and March 30, 1915; four from Avakubi, October 3, 1909; six from Faradje, February 17 and 22, 1911, October 4 and 22, 1912; nine from Garamba, May and June 1912; ten from near Lié, July 26, 1909; three from Niangara, November 1910; two from Akenge, September 1912; and one from each of the following localities: Leopoldville, July 9, 1909; Lukolela, July 17, 1909; Bafwaboka, December 3, 1909; Nepoko, March 4, 1910; Poko, August 1913; Thysville, June 2, 1915; and Boma, June 15, 1915. (A. M. N. H. Nos. 8406–8463; 8582–8585.)

DISTRIBUTION.—Although it has been generally assumed that *B. regularis* is widely distributed throughout all of Africa except Barbary, Boulenger in 1900 and again in 1905 mentioned that he had not observed any specimens recently taken in the Cameroon-Gaboon area. Nieden (1908*a*) in referring to the latter statement lists a number of Cameroon specimens. *B. regularis* occurs throughout the Ituri forest as the above-mentioned localities indicate, but it was found most abundantly, and in some localities only, in the clearings about habitations. This apparent preference of *B. regularis* for clearings may account for its absence in the Cameroon collections reported upon by Boulenger.

VARIATION.—The specimens in our series (maximum head and body length, 98 mm.; minimum, 18 mm.; average, 73 mm.) vary in color from a pale yellowish, blotched with gray, to a uniform blackish brown. Only one specimen (No. 8412, Garamba, June 1912) shows any indication of the bright pink tones mentioned by Boulenger (1907*e*, p. 479, Pl. XXI). Some of the specimens in the series from the savannahs of Garamba can be matched in the series from the forest about Stanleyville. In life the majority of the specimens were some tone of "brown blotched with a darker brown; the iris a silvery brown with a golden band across its horizontal axis."

B. regularis shows a slight sexual dimorphism other than size. Our large series of thirty-four females, nineteen males, and three very young individuals shows that this dimorphism is not a constant feature. The majority of breeding males are spiny, each wart on the back consisting of a single spine surrounded by a group of smaller ones. The majority of females are not spiny but possess large flat warts on their dorsal surfaces. Five sexually mature males are not spiny and, except for some indication of digital asperities (absent in one), more slender body form, and slightly smaller size (marked difference in some specimens), cannot be distinguished externally from the breeding females of the same localities. Six of the females show an indication of spinosity. These specimens have more or less of the dorsal warts replaced by spines, but these spines are single, not compound as in the males. *B. regularis* is like *B. marinus* of South America in its ubiquity, but is unlike that species in that the spinosity of breeding males is not a constant character.

HABITS.—An examination of the sexual organs of the series of specimens has allowed me to infer that the breeding season of *B. regularis* is extended in the Belgian Congo through several months. One of two females (Nos. 8449–8450) taken at Avakubi, October 3, 1909, has the ovaries greatly distended with large ova, while the other has the "pepper and salt" gonads characteristic of the time directly following oviposition. One of another pair (Nos. 8444–8445) from Medje, August 29, 1910, has the distended ovaries, while the other has the post-oviposition condition. None of the females taken in any part of the Belgian Congo from November to March have the ovaries enlarged. April and May specimens show intermediate conditions. Two specimens from Akenge taken in September 1913 are both females exhibiting the "pepper and salt" ovaries. One specimen (No. 8451) from Stanleyville, August 21, 1909, possesses very large ova. The majority of the females taken in Medje during August have distended ovaries. It seems probable that the breeding season of *B. regularis* in the Rain Forest is extended through the months of August, September, and early October.

The breeding season of *B. regularis* throughout the rest of Africa varies according to the locality. Fischer (1884) states that breeding pairs were found in the vicinity of Naivasha Lake, British East Africa, on May 11. Andersson (1911) reports mated pairs in the vicinity of Nairobi on April 11, 1911, while Lönnberg (1910) gives a detailed account of a breeding chorus at Kibonoto, Kilimanjaro, on July 26, 1905. Hewitt and Powers (1913) discuss the breeding of *B. regularis* in South Africa:

> At Modder River the breeding season commences about the end of September or beginning of October, when the males resort to little pools amongst the rocks and during night-time make loud and incessant calls to attract the females; the vocal sac, bluish in color, becomes inflated to about twice the size of the head. The male call resembles the hoarse "wook-wook" of duck, and the female responds with a call like "woop," followed by a quick "wop-wop."

The field notes of Mr. Lang indicate that these toads do not confine their croaking to the time when they are in the water: "Five large toads taken at Stanleyville, August 4, 1909, were found catching insects about the palm oil lamps which light the roads. They were frequently observed to catch small moths. These toads croaked very loudly at intervals, often repeating their call for the duration of half a minute."

Thirty-eight stomachs contained food which consisted of 377 worker and soldier termites and the débris of many others; 46 beetles (carabids, curculionids, dung-beetles, etc.); 474 ants (males, females, and workers), and the débris of others; 7 heteropterous and 1 homopterous insects; 10 myriopods (julids, scolopendrids, etc.); 4 spiders; 30 dipterous larvæ; 5 caterpillars; 3 isopods; 3 crickets; 1 grasshopper; 1 earwig; 2 leafhoppers; 5 caddice-flies; and 4 snails (*Limicolaria*, etc.).

Snakes are known to feed on *B. regularis.* A specimen (A. M. N. H. No. 12303) of *Leptodeira hotamboeia* taken at Garamba, July 5, 1912, disgorged a specimen of *B. regularis* which hopped away as soon as released. Another toad of the same species was found in its stomach.

Bufo funereus Bocage

Plate XXVIII, Figure 1

Bufo funereus Bocage, 1866, Jorn. Sci. Lisboa, I, p. 77 (type locality: Duque de Bragança, Angola). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' pp. 281 and 475. Bocage, 1895, 'Herpétol. Angola,' p. 186 (Angola: Duque de Bragança and Caconda); 1897, Jorn. Sci. Losboa, (2) IV, p. 205 (Angola: Duque de Bragança and Caconda); 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Fernando Po and French Congo). Ferreria, 1906, Jorn. Sci. Lisboa, (2) VII, p. 166 (Angola). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 509 (Longji, Cameroon). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge LIV, No. 2, p. 136 (Efulen, Cameroon). Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Dahomey).

Bufo benguelensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 299, Pl. xix, fig. 3 (Benguella and Fernando Po).

Bufo gracilipes Boulenger, 1899, Ann. Mag. Nat. Hist., (7) III, p. 276, Pl. xii, fig. 2 (Benito River, Gaboon); 1900, Proc. Zoöl. Soc. London, p. 436 (locality of Boulenger 1899); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John).

Bufo regularis Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 244 (part: Bibundi, Cameroon). (Not of Reuss, 1834.)

Seventy-two specimens ranging in size from 31 to 62.5 mm.: twenty-seven from Medje, one specimen September 14 and two September 23, 1910, one specimen in March, four in April, three in April or May, thirteen in June and three in July 1914; sixteen specimens from Akenge, September and October 1913; thirteen specimens from Niapu, November 1913 and January 1914; four specimens from Niangara, November 1910 and June 1913; three specimens from Avakubi, October 31, 1909 and January 10, 1914; two specimens from Ngayu, December 12 and 20, 1909, two specimens from Boyulu, September 22, 1909; and one specimen from each of the following: Bafwaboli, September 13, 1909; Bafwamoko, September 14, 1909; Batama, September 16, 1909; Bafwasende, September 23, 1909, and Poko, August 1913. (A. M. N. H. Nos. 8510–8581.)

Distribution.—The fact that *B. funereus* was found by the American Museum expedition only in the Rain Forest or outlying forest galleries, such as Niangara, renders the reported distribution of the species difficult to interpret. Careful comparison of specimens from southern Angola with those from the Rain Forest should be made before any explanation is offered for the unusual distribution. The species has not been found to extend its range into the savannah areas lying to the north or to the east of the Rain Forest, and there seems to be no reason for the appearance of the species in southern Angola.

Variation.—*B. funereus* has been carefully described by Boulenger (1900) under the name of *B. gracilipes*. It is a very distinct species of toad, with its numerous, closely set warts above, narrow paratoids, and rather slim head. It could be confused only with the male of *B. regularis*. The absence of tarsal fold and short first finger distinguishes it from that species. Still young individuals sometimes have an indication of a tarsal fold (as in No. 8516), or at least have the outer tarsal warts arranged in a straight line, simulating a fold. These young specimens may be distinguished from the young of *B. regularis* by the smaller, more numerous granules of the back, narrower paratoids, and slight instead of distinct tarsal fold.

The majority of the specimens in the series are nearly a uniform brown above, indistinctly marbled with a darker tone. Few of the specimens possess a well-defined pattern. This consists of two pairs of dark spots on the back and two pairs on the head, one pair of the latter being in front, and the other behind the orbits. The sides of the body are reticulated with a dark brown and the legs are crossbanded. Two of the males, which are less warty than the females, have the ground tone of the back a yellowish gray, and one specimen (No. 8457) has the legs heavily washed with a blackish brown. In life *B. funereus* was "brownish above with irregular dark markings. The sides of the body were distinctly lighter and there was an indication of a light vertebral line."

One specimen (No. 8518) from Ngayu, December 12, 1909, was "rusty brown above, pinkish on the chest and yellowish gray on the abdomen. The iris was light bronze."

The majority of the males in our series may be readily distinguished from the females by their smaller size and smoother dorsal skin. The male (No. 8550) of a pair taken in embrace at Niangara, November 1910, is distinctly smaller than the female (No. 8551), being only 46 mm. in length as against 62 mm. But a breeding pair taken at Medje on September 23, 1910, does not show this difference, the male measuring 40 mm. and the female 49. Ten of the seventeen males have only a few scattered tubercles above, and not the dense matting of fine tubercles given as characteristic of the species. But six of the males, all from Niapu, January 1914, are exactly as tubercular above as the females. One male from Boyulu, September 22, 1909, represents an intermediate condition. It is apparent that smoothness of skin is not a constant feature in the male.

HABITS.—*B. funereus* was often taken "under dead tree trunks and among the leaves about the plantations. One was found in the rest house at Bafwamoko. The majority were collected in the forest under fallen trees and other dead wood."

This species has perhaps a more extended breeding season than any of the other toads in the collection. Pairs in embrace were taken at Avakubi on October 3 (1909). At Niangara breeding pairs were observed about the middle of November (1910). Females with greatly distended ovaries were taken in July (Medje, 1914), on September 14 (Medje, 1910) on September 23 (Bafwasende, 1909), on December 12 (Ngayu, 1909) and in the middle of January (Niapu, 1914). This difference of sexual maturity is not wholly dependent upon difference in locality. Two specimens of nearly the same size (Nos. 8557 and 8558) taken at Medje on June 6, 1910 exhibit a great difference in the degree of development of their ova. Moreover, I fail to find any marked uniformity from any other locality, although such uniformity is the rule in the other species of toads. Males possess well-developed nuptial asperities from June 6 (Medje, 1914) to January 10 (Avakubi, 1914). But, since all except one of the seventeen males in the collection have some indication of the nuptial asperities, too much emphasis should not be laid upon the development of these structures. Sexual maturity in *B. funereus* is very irregular, which condition may indicate a prolonged breeding season.

The stomachs of sixty-two specimens contained food. This consisted of 426 worker termites, 86 winged termites and the fragments of many others; 59 beetles (Curculionidæ, longicorn, etc.) and the fragments of others; 735 worker ants and the heads of a few others; 2 hymenopterous insects (a psammocharid and a mutillid); 1 heteropterous and 3 hemipterous insects (Reduviidæ, etc.); 6 myriopods (julids, polydesmids, etc.); 6 spiders, 6 caterpillars; 3 roaches; 2 earwigs; 1 grasshopper; and 1 leaf-hopper.

Bufo tuberosus Günther

Bufo tuberosus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 60, Pl. iii, fig. C (type locality: Fernando Po). Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 202 (Abo, Cameroon). Boulenger, 1880, Proc. Zoöl. Soc. London, p. 572 (Fernando Po; Gaboon); 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 304 (Fernando Po; Gaboon); 1887, Proc. Zoöl. Soc. London, p. 565 (Rio del Rey, Cameroon). Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 202 (Cameroon). Boulenger, 1900, Proc. Zoöl. Soc. London, p. 435 (Benito River, Gaboon); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Fernando Po). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, Heft 4, p. 509 (Victoria, Johann-Albrechtshöhe, Bipindi, Cameroon; Makomo, Spanish Guinea). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Mundame, Cameroon). Nieden, 1910, 'Fauna Deutschen Kol.,' I, Heft 2, p. 68, fig. 147 (Victoria, Johann-Albrechtshöhe, Bipindi, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Kribi, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 220 (Cameroon: Bibundi and Campo).

Six specimens, varying in size from 27.5 mm. to 68 mm. in length (snout to vent): Ngayu, three specimens, December 12; one, December 16, 1909; Bafwabaka, one specimen, probably December 1909; Medje, one specimen, April-May 1910 (A. M. N. H. Nos. 8400-8405).

Distribution.—The range of *Bufo tuberosus* is considerably extended by the discovery of these six specimens in the Ituri forest. No doubt further collecting will demonstrate that the species is widely distributed throughout the Rain Forest. But no specimens have as yet been taken west of Cameroon.

Variation.—*Bufo tuberosus*, with its prominent egg-shaped parotoid glands and scattered dorsal spines, cannot be confused with any other forest toad. It has been so minutely described by Boulenger (1880, pp. 572-573) that little further need be said here. In none of the specimens of our series are the parotoid glands as large as those indicated by Günther (1858, Pl. iii, fig. *C*). These structures vary in size from one-half (smallest specimen) to two-thirds (two largest specimens) the diameter between their anterior borders and the nostrils, and do not equal that distance as shown in Günther's excellent figure.

The specimens in our series are not brightly colored and do not present the vertebral line mentioned by Boulenger (1900, p. 435). The predominating tones are grays and browns. The four specimens from Ngayu are somewhat differently colored from the other two in the series. The ground tone above is a pale gray, becoming white below. The dorsal surface is heavily blotched with steel-gray while the ventral surface is more or less marbled with same color. This marbling is so extensive in one specimen (No. 8403) that the white tone has a stippled appearance. The other two specimens in the series are from northern localities. Their dorsal gray tones are suffused with a dark brown and there are no marblings on the ventral surfaces, which present a uniform muddy appearance.

HABITS.—Little is known about the habits of *B. tuberosus.* Most of the specimens in our series were "caught by pygmies in the forest; and were said to live in the swamps."

Five of the specimens contained food in their stomachs. This consisted of 121 termites (workers and soldiers of two species), 38 ants (workers of several species); one beetle (Curculionidæ); and one ichneumonid wasp.

Bufo polycercus Werner

Plate XXVIII, Figure 2

Bufo polycercus WERNER, 1897, Sitzber. Akad. Wiss. München, XXVII, p. 211 (type locality: Cameroon); 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 719.

Bufo latifrons BOULENGER, 1900, Proc. Zoöl. Soc. London, p. 435, Pl. XXVII, fig. 1 (Benito River, Gaboon); 1906, (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158 (Fernando Po). (?) CALABRESI, 1906, Monitore Zool. Ital., XXVII, p. 37 (Southern Somaliland). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 508 (Cameroon: Barombi, Victoria, Bipindi, Johann-Albrechtshöhe, Longji, Jaunde, and Jabassi; Spanish Guinea: Makomo). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 67, Figs. 145 and 146 (Cameroon, same localities as Nieden 1908). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Efulen, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 219 (Cameroon: Bibundi, Dehane, and Isongo). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush', p. 470 (Nigeria). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, pp. 186 and 191 (South end of Lake Albert Edward; Entebbe on Lake Victoria; and forest between Mawambi and Avakubi, Belgian Congo); 1915, Mitt. Zool. Mus. Berlin, VII, p. 386 (same as Nieden, 1912).

Bufo regularis WERNER, 1900, Arch. Naturg., LXVI, part 2, p. 58 (not of Reuss 1834). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 417 (French Guinea). STEINDACHNER, 1906, Ann. Hofmus. Wien, XXI, p. 154 (Cameroon).

Forty-six specimens, all adult: twenty-three from Medje, seven of which were taken during April-May 1910, one on August 29, 1910, one in March 1914, seven in April 1914, six in June 1914, and one in July 1914; eighteen specimens from Akenge, September and October 1913; two from Gamangui, February 18, 1910; two from Niapu, November 1913 and January 1914; and one from Ngayu, December 19, 1909. (A. M. N. H. Nos. 8464–8509.)

Distribution.—*B. polycercus* is apparently confined to the Rain Forest and outlying forest islands. Except for one very dubious record of *B. polycercus* in southern Somaliland (Calabresi, 1906), no specimens have ever been taken in other than forested regions. Our forty-six specimens help to confirm the opinion of Nieden (1912, p. 191) that this species has a continuous range throughout the Rain Forest.

Relations.—*B. polycercus* has been confused with *B. regularis* by various authors, and it is probable that some of the specimens recorded from the Rain Forest as *B. regularis* may yet prove to be referable to the former, more typical, forest species. The distinguishing characters given by Boulenger (1900, p. 435), but more especially those pointed out by Nieden (1908*a*, p. 509), are very apparent in our two large series of specimens. As Nieden has indicated, the chief difference lies in the wartiness of the skin. *B. regularis* never possesses the large pointed warts on the sides of the body. Even when the dorsal surface of *B. polycercus* is nearly smooth, the lateral spines are prominent forming a ready means of distinguishing the two species.

The largest warts in *B. polycercus* are arranged as in *B. tuberosus* in a group just behind each angle of the mouth. Both species occur together in the Rain Forest. The former, however, is readily distinguishable from the latter by its narrow, elongate parotoids.

Variation.—The color of most of our specimens has faded in alcohol to some tone of brown indistinctly marked with black. In a few of the specimens the pattern is very distinct. It consists of two pairs of black spots, one pair on the scapular, the other on the sacral region, and one or two dark interorbital bars. The limbs are crossbarred with black and the sides vermiculated with the same color. A light vertebral line is generally present. In our brightest specimens (Nos. 8493 and 8496, females from Akenge, September 1913) the sides were tinged with salmon. This coloration served to distinguish the toad in the field. The description made in the field of one of the specimens (No. 8493) mentioned above may be taken as characteristic of the species: "Ground tone brown above, grayish or greenish on the limbs; the dark spots on the back a velvety black; sides of the head and body tinged with a rich pink; vertebral surface whitish changing to pink posteriorly. Iris silvery gray."

HABITS.—One pair of the toads was taken in embrace at Akenge during October 1913. Only one other male was found, that at Medje during May and June 1914. An examination of the ovaries of the forty-four females in the series has allowed me to infer that the breeding season may extend through more than one month. The ovaries of one specimen (No. 8497) taken in September at Akenge exhibit post-oviposition conditions. Mature ova are found in three specimens (Nos. 8481–8483) from Medje taken in June and July, and nearly mature ova in another specimen (No. 8491) taken in May at the same locality. The ovaries of three specimens (Nos. 8506, 8505 and 8501) from Akenge, October 1913, are greatly distended. No specimen from any locality taken between the months of November and April have the ova at all enlarged. It is evident that the ova of *B. polycercus* reach maturity between the months of May and October.

The stomachs and intestines of nearly all the specimens contained parasitic worms. Several of the stomachs were covered with numerous cysts. The intestine immediately posterior to the pylorus of one specimen (No. 8504) possessed a large rent. Since the edges of the rent were curled back and hardened, the wound must have been made before the capture of the toad. In spite of this opening of the alimentary tract into the cœlum, the stomach of the toad contained food and the usual parasitic worms were found in the intestine.

Forty-two stomachs contained food: 41 winged termites and 234 workers; 72 beetles (Curculionidæ; Staphylinidæ, etc.); 14 male and female ants and 393 workers; 2 wasps (*Polybioides tabida* and *P. melaina*); 2 heteropterous and 6 hemipterous insects (Reduviidæ, etc.), 5 dipterous larvæ; 16 myriopods (Julidæ, Scolopendridæ and Polydesmidæ); 14 spiders; 12 caterpillars; 4 beetle larvæ, 2 isopods; 1 grasshopper; 1 cricket; 1 leaf-hopper; and 1 snail.

Bufo polycercus is fed upon by snakes and probably other animals. Partial remains of this toad were found in the stomachs of two specimens of *Dipsadoboa unicolor* (A. M. N. H. Nos. 12474 and 12475) taken at Medje during March 1914.

Bufo superciliaris Boulenger

Plate XXV, Figure 2

Bufo superciliaris BOULENGER, 1887, Proc. Zoöl. Soc. London, p. 565 (type locality: Rio del Rey, Cameroon); 1890, p. 325 (Rio del Rey, Cameroon); 1900, p. 436

(Benito River, Gaboon; and the Belgian Congo). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 26 (Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 510 (Cameroon: Victoria, Bipindi, and Kribi). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea, Cameroon). NIEDEN 1910, 'Fauna Deutschen Kol.,' (1), Heft 2, p. 66, fig. 142 (Spanish Guinea: Makomo; Cameroon; localities of Nieden 1908). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 136 (Ja River, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 219 (Cameroon: Dehane and Campo). BOULENGER, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria). BOULENGER, E. G., 1914, 'Reptiles and Batrachians,' p. 224, fig. (Cameroon).

Bufo lævissimus WERNER, 1897, Sitzber. Akad. Wiss. München, XXVII, p. 212 (Cameroon); 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 202, Pl. II, fig. 1 (Cameroon).

Bufo superciliosus WERNER, 1900, Arch. Naturg., LXVI, part 2, p. 58. (Misspelling for *Bufo superciliaris* Boulenger.)

Seventy-nine specimens, thirteen of which are skeletons: Medje, one specimen, January 1910, three, August 1910, seven, September 1910, twenty, April 1914, fourteen, June 1914, and eight, July 1914; Niapu, three specimens, November 1913, six, December 1913, and three, January 1914; Gamangui, seven specimens, February 1910; Ngayu, six specimens, December 1909; locality uncertain (tag corroded) one specimen. (A. M. N. H. Nos. 8586–8664.)

DISTRIBUTION.—As in the case of many other forest species formerly only known from the Cameroon-Gaboon area, the range of *B. superciliaris* was found to extend much farther eastward than formerly reported. The species is confined to the Rain Forest and represents the largest and most striking toad of this region. Still it has not been reported farther west than Nigeria. Future work may show that the species does not occur in the extreme western end of the forest, but our present knowledge of that area is so limited that little can be said.

VARIATION.—The coloration of *B. superciliaris* has been adequately described by Boulenger (1887*a*). It may be added that the one or two pairs of black ocelli on the back are often narrowly outlined with pale yellow. The parietal chevron is not present in most of the large specimens. In life the coloration was generally brighter, especially the rich maroon wash of the sides; and the yellowish dorso-lateral line was sharply defined. The iris was a "dark bronzy brown."

The forty-three females and twenty-two males in the series exhibit no sexual difference other than size. Fifteen fully adult males average 106.7 mm. from snout to vent (maximum, 112; minimum, 98 mm.) in contrast to 136.9 mm., the average of the same number of sexually mature females (maximum, 149; minimum, 133 mm.). No nuptial asperities are developed on the digits of the breeding males.

Habits.—Oviposition may occur throughout several months. It certainly occurs in April, for one specimen (No. 8587) taken at Medje early in April still contained ova in its cloaca and oviducts. About fifty eggs had been squeezed into the urinary bladder. No ova were found in the cœlom, and the ovaries exhibited the usual post-oviposition conditions. *B. superciliaris* is potentially able to oviposit throughout most of the year. Females with greatly distended ovaries were taken in April (Medje, 1914), June and July (Medje, 1914), August (Medje, 1910), November and December (Niapu, 1913), January (Niapu, 1914) and February (Gamangui, 1910).

Bufo superciliaris is active throughout the rainy season, which continues in most of the forest throughout the entire year except for a few weeks in February or March, these weeks varying with the locality and the year. During this rainy season *B. superciliaris* "was found practically everywhere in the forest, but during the dryer weeks the toad disappeared, only a single specimen or two to be found after long searching in some shallow depression, usually among the damp leaves of the forest, especially in hollows where the humus and moldering leaves remain damp throughout the year. When disturbed, the quiescent toad would play dead, lowering the head to the ground, and drooping the prominent upper eyelids. At such times the toad is able to squirt the secretion of its parotoid glands to a distance of several feet. The natives are greatly afraid of this whitish secretion for they believe that it is able to destroy the eyesight."

The stomachs of fifty-five specimens contained food. It is noteworthy that often large insects but never any vertebrates were found in the stomachs. The food consisted of 453 worker and soldier termites (all but three from a single stomach); 86 beetles (mostly large longicorns, carabids, Curculionidæ, dung-beetles, etc.); 182 ants; 1 ichneumonid and 1 chalcid wasp; 16 myriopods (julids, polydesmids and platydesmids); remains of 3 grasshoppers; 2 caterpillars, 1 isopod, 1 beetle larva, 1 ant-lion larva, 13 dipterous larvæ and a small amount of leaves and other extraneous matter.

Morphological Notes.—In correlation with the great body size, the eggs of *B. superciliaris* have not become very much larger than those of other forest toads but they are very much more numerous. The average diameter of ten eggs (envelopes removed) from the urinary bladder of the specimen (No. 8587) mentioned above as having just deposited its eggs is approximately 1.8 mm., maximum diameter 2 mm., and minimum 1.6; while the average of the same number of eggs removed from the cœlom of a gravid specimen of *B. polycercus* (No. 8501) is 1.5 mm., maximum 1.6 mm. and minimum 1.4. By removing a single lobe of an ovary, counting the ova in it, and multiplying by the total number of lobes, we may estimate the number of eggs in any gravid female. The number in the specimen of *B. polycercus* mentioned above was found to be between 1200 and 1500. *B. superciliaris* develops many more eggs than this. One specimen (No. 8588) was estimated to have at least three times, probably three and a half times, as many. That this rough estimate cannot be very far out of the way is shown by the fact that the ovaries of the two specimens vary in length in the proportion of one to two, while the ova differ in the proportion of two to three. The size of the ovaries is more or less dependent on the size of the toad, and in the present case the specimen of *B. polycercus* is 71 mm. long while the specimen of *B. superciliaris* is 142 mm.

In apparent correlation with the great increase in number of eggs of *B. superciliaris*, the male reproductive organs are extraordinarily developed. Even before the breeding season and when the fat bodies are still very small, the tests become greatly lengthened and folded into many turns. Each testis of one specimen (No. 8586, Niapu, December 1913) is twisted back and forth across the kidney with six sharp turns. The kidneys are not oval but slightly lobate, the lobes underlying the turns of the testes. If the testes could be straightened out, they would measure at least twice as long as the kidneys. Our series of twenty-two males shows definitely that this twisting of the testes is due to an increase in length, but this increase is greater than that which I have observed in any other species of *Bufo*.

Ranidæ

Of the thirty-nine genera of Salientia found in Africa, twenty-two, or fifty-six per cent, are ranids, and all but three of these twenty-two genera are confined to the continent. Two of the three exceptions, *Megalixalus*, and *Hyperolius*, are characteristically African but have extended their range to Madagascar, while the third exception, *Rana,* is a recent arrival in Africa from the north.

It is of little value to state that the African ranids (with the exception of *Rana*) are all typically African, either indigenous to that continent or migrants from there, unless some attempt is made to determine the mutual relationships of these genera and to seek the stocks from which they have arisen. This undertaking offers considerable difficulty because our knowledge of the internal structure of most of these genera is very limited. From a study of their osteology it seems probable that certain of them, such as *Chiromantis*, very probably find their closest affinities in genera not found today in Africa, but others may very probably have arisen directly from indigenous genera. A third category includes genera whose affinities to other genera are so close that their generic status is questionable. For purposes of discussion it is advisable to divide the twenty-two genera of ranids into a number of natural groups and to examine what evidence there is as to the affinities of these groups.

GROUP I.—*Astylosternus*, *Gampsosteonyx*, *Scotobleps*, and *Nyctibates*. These four genera form a natural group of closely related genera confined to the Cameroon-Gaboon area. It is a matter of opinion whether or not *Gampsosteonyx* is really generically distinct from *Astylosternus*. *Scotobleps*, *Nyctibates*, and *Astylosternus* differ from each other chiefly in the degree of ossification of the various parts of the pectoral girdle. I have remarked on certain specialized features of this group elsewhere.[1] Too little is known about the morphology of these and related genera to offer an opinion as to the stock from which they have arisen. Still, it seems fairly certain that they are local specializations of the oldest ranid stock of Africa.

GROUP II.—*Phrynobatrachus*, *Arthroleptis*, *Arthroleptides*, *Petropedetes*, *Dimorphognathus*, *Schoutedenella* and *Cardioglossa*. These genera are all small, active ranids, very similar in general appearance. Witte (1919), in reviewing the genus *Phrynobatrachus*, states that since Boulenger has abandoned the extent of the webbing between the metatarsals as a character defining the genus *Rana*, the extent of this web in *Phrynobatrachus* is probably not a good character to distinguish *Phrynobatrachus* from *Arthroleptis*. As shown in Figure 5, the extent of the separation of the metatarsals is extremely variable. *P. natalensis*, the type of the genus, may be said to have the metatarsals as closely bound together as the majority of the species of *Arthrolepis*. The only character commonly used to distinguish *Phrynobatrachus* from *Arthroleptis* is the separation of the outer metatarsals by a web but, since this distinction is entirely arbitrary, this character can be of little importance in distinguishing these genera.

The form of the pectoral girdle was considered by Boulenger of primary importance in defining his subgenera of *Rana*. A study of this structure in all the species of *Arthroleptis* and *Phrynobatrachus* available to me has helped to demonstrate that the character of the metatarsal region cannot be correlated with any grouping of the species based on the structure of the pectoral girdle. Species with a λ-shaped omosternum (Plate XXIX) may or may not have the separated metatarsals and species with an entire omosternum are at present grouped under both *Arthroleptis* and *Phrynobatrachus.*

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[1] Noble, 1920, p. 17.

If we should abandon the metatarsal character entirely and use the form of the pectoral girdle in distinguishing *Phrynobatrachus* from *Arthroleptis,* further difficulties would immediately present themselves. A complete series of intergradation may be found between the two extremes of girdle form. Examples from this series are represented in Plate XXIX.

Although no characters can be found to group into definite categories the species at present ranged under *Arthroleptis* and *Phrynobatrachus,* still the study of the pectoral girdle has shown that the relationships between certain species are much closer than between others, and these relationships are indicated in part by a pectoral girdle of identical form in these related species. Thus the pectoral girdles of *A. variabilis* and *A. pœcilonotus* agree in all essential particulars; similarly those of *A. bottegi, A. feæ,* and *A. parvulus* have the same form; and those of *P. plicatus* and *P. dendrobates* are indentical and are not very different from that of *A. batesii.*

If the form of the pectoral girdle is an index of relationship (as in *Rana*) it is of especial interest that the girdles of *A. wahlbergi* and *P. natalensis,* the type species of *Arthroleptis* and *Phrynobatrachus* respectively, should be identical. It is also important to note that the pectoral girdle of *Cardioglossa leucomystax* is very similar to that of *A. wahlbergi* while that of *Dimorphognathus africanus* is practically identical with that of *A. batesii.* This has been mentioned in my discussion of the classification of the Salientia (Noble, 1922). There is good reason to believe that *Cardioglossa* has been derived directly from an *A. wahlbergi-A. variabilis* stock by a loss of teeth and *Dimorphognathus* from an *A. batesii* stock by the development of teeth on the mandible. When all the species of *Arthroleptis* and *Phrynobatrachus* have been studied osteologically, a number of natural groups will be found. It has seemed advisable for the purposes of this paper and to avoid further complicating the synonymy to use the terms *Arthroleptis* and *Phrynobatrachus* in their old sense, although it is obvious from the above discussion not only that these genera are two very unnatural assemblages but also that the one character which distinguished them from each other is untrustworthy, even undefinable.

It is impossible to say at the present time from what stock this *Arthroleptis-Phrynobatrachus* group springs. Their procœlous vertebral column and cartilaginous metasternum are indicative of their generalized structure. They do not seem to have any close affinities in the Oriental or Neotropical regions.

Group III.—*Hylambates, Kassina, Hyperolius, Megalixalus, Leptopelis,* and *Chiromantis.* Two very distinct groups of species have up to the present time been referred to *Hylambates.* This is the more surprising since Peters (1882, Pl. xxvi, fig. 4) gave an excellent figure of the pectoral girdle of the type of the genus, *H. maculatus.* In this species the omosternum is forked posteriorly and the metasternum is a broad cartilaginous plate. Two of the species taken by the American Museum expedition, *H. verrucosus* (Plate XXXI, fig. 1) and *H. greshoffi* (Plate XXXI, fig. 2) have a similar pectoral girdle, but in all the other species usually referred to *Hylambates* which I have examined the omosternum was found to be entire and the metasternum bony. Until intermediates can be found it seems advisable to distinguish the second group of species by a name. The first name available for that purpose appears to be *Leptopelis.*

I am not at all sure that annectant forms will be found between the first and second groups. *Leptopelis* seems to comprise a distinct group of species as nearly related to *Chiromantis* as to the group of species which I now restrict to the genus *Hylambates.* The pectoral girdle of *Hyperolius, Megalixalus,* and *Kassina* are very similar to that of *Hylambates* (*sensu stricto*). The first two genera may have been derived directly from *Hylambates* by a loss of the vomerine teeth. *Hyperolius* differs from *Hylambates* only in the absence of these structures.

In recent years much evidence has been accumulated to show the trivial significance of the absence of the vomerine teeth as defining natural groups. Among the pipids there is at least one case (*Xenopus*) where the presence or absence of vomerine teeth in the adult has not even specific importance (Boulenger, 1919, p. 3). Among the pelobatids there are several instances (*Leptobrachium* and *Xenophrys*) of the same (Boulenger, 1889, p. 750; Sclater, 1892, p. 348). In the toothed bufonids and hylids the presence of vomerine teeth is a variable feature in several genera: *Telmatobius* (Barbour and Noble, 1920, p. 416); *Hyla* (Van Kampen, 1906, p. 174, and Noble, 1918, p. 335). Among the ranids this variability of the vomerine teeth is even more frequent: *Rhacophorus*

(Boulenger, 1897, p. 234); *Kassina* (Peracca, 1907); *Rana* (Boulenger, 1897, p. 234); and *Staurois* (Boulenger, 1918*c*, p. 373). It appears then that the structural difference which distinguishes *Hyperolius* from *Hylambates* is very slight.

Kassina possesses a peculiarity which leads one to suspect that it has not been evolved directly from *Hylambates.* The terminal phalanges are dilated very much as in *Chiromantis.* Nevertheless, *Kassina,* with its widely divided omosternum, very probably was not evolved directly from *Chiromantis.*

Chiromantis has much in common with *Polypedates.* That widely distributed genus is sufficiently generalized to form the stock from which *Hylambates, Leptopelis, Kassina, Chiromantis,* and their derivatives, *Hyperolius* and *Megalixalus,* may have evolved. I have shown elsewhere (1917, p. 793) that T-shaped terminal phalanges may be changed during the ontogeny of an individual to simple terminal phalanges, and I have suggested that claw-shaped phalanges are easily derivable from these. *Chiromantis,* with its undivided omosternum and dilated terminal phalanges, stands nearest to the *Polypedates* stock than any of the other members of this group.

Group IV.—*Phrynopsis, Leptodactylodon,* and *Rothschildia.* The first and last of these three genera are known to me only from the descriptions. *Leptodactylodon* seems to have much in common with *Phrynopsis.* Nevertheless, it does not always have a cartilaginous omosternum as often stated. A breeding male (No. 6726) which I examined was found to have a well ossified style to the omosternum. It seems probable that *Leptodactylodon* and *Phrynopsis* have been derived from some ranid stock of Group I.

The affinities of *Rothschildia* are a puzzle. Its pointed terminal phalanges, united metatarsals, cartilaginous omosternum and sternum, clearly indicate that it cannot have any close relationship to *Chiromantis* in spite of Mocquard's (1905, p. 288) statement to the contrary. Further study may show that it is related to *Phrynopsis,* or possibly *Hyperolius.*

Group V.—*Rana* and *Conraua.* The latter genus is probably not generically distinct from the former. Boulenger (1918) has recently discussed the origin and affinities of the African species of *Rana* and, since not only the genus but also certain groups of species find their closest affinities beyond the continent. it seems very probable that the genus is only a recent migrant into Africa, probably by way of the northeast. It is interesting, however, that the genus should have extended so widely over the continent and have become such a dominant element of its batrachian fauna.

PHRYNOBATRACHUS Günther

This genus has been recently monographed by Witte (1919 and 1921). As shown in the appended check list, I have not been able to agree with him on the status of certain of the species. Nevertheless, Witte's synopsis so nearly agrees with my views that it does not seem advisable to offer an additional key to the species. Werner (1919) has recently published a key which expresses his views as to the recognizable species.

Natalobatrachus Hewitt and Methuen is certainly synonymous with *Phrynobatrachus*. *N. bonebergi* is closely allied to *P. dendrobates* and *P. plicatus*. A microphotograph of the pectoral girdle of *N. bonebergi* is represented in Plate XXIX, fig. 8. The species should be referred to *Phrynobatrachus*.

Phrynobatrachus natalensis (A. Smith)

Plate XXXIII, Figure 1; Text Figure 5

Stenorhynchus natalensis SMITH, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 24 (type locality: Port Natal).

Phrynobatrachus natalensis BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 112 (Natal and Angola: Duque de Bragança). PETERS, 1882, 'Reise nach Mossambique,' III, p. 156 (Tette, Mozambique). PFEFFER, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (Zanzibar). BOETTGER, 1892, 'Kat. Batr. Mus. Senck.,' p. 19 (Abyssinia). BOULENGER, 1892, in Distant, 'A Naturalist in the Transvaal,' p. 176 (Pretoria). BOCAGE, 1895, 'Herpétol. Angola,' p. 162 (High plateaux of the interior of Angola: Duque de Bragança, Quissange, Quindumbo, Caconda, and Bihé). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, p. 101 (Mozambique); p. 211 (Hanha). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 96 (German East Africa: Zanzibar, Usambara, Usagara, Kakoma, Unyamwesi, Nyansa, Undussuma, and Kinangiri). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Transvaal). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). SCLATER, 1899, Ann. S. African Mus., I, p. 107 (South Africa). TORNIER, 1901, Zool. Anz., XXIV, p. 64 (Port Elizabeth). BOULENGER, 1902, Proc. Zoöl. Soc. London, II, p. 15 (Mashonaland). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 406 (British East Africa). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 108 (Angola: Bange Ngola); Proc. Zoöl. Soc. London, II, p. 251 (Zululand: Sibudeni). FERREIRA, 1906, Jorn. Sci. Lisboa, (2) VII, p. 166 (Angola). BOULENGER, 1907, Proc. Zoöl. Soc. London, II, p. 482, Pl. XXII, fig. 2 (Portuguese East Africa: Coguna and Beira). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1901 (Sudan). BOULENGER, 1908, Ann. Natal Mus., I, p. 222 (Zululand: Mseleni and Hlabisa). CHUBB, 1908, Ann. Mag. Nat. Hist., (8) II, p. 220 (Matabeleland: Gwamaya and Kana Rivers). ODHNER, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 7 (South Africa: Durban, Umfolozi, and Lake Sibayi). CHUBB, 1909, Proc. Zoöl. Soc. London, II, p. 592 (Matabeleland: three localities). BOULENGER, 1910, Ann. S. African Mus., V, p. 529 (Natal, Zululand, Transvaal, Orange River Colony, Southern Rhodesia, Angola, Central and East Africa). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 23 (Kilimanjaro). MEEK, 1910, Publ. Field Mus., Zoöl., VII, p. 403 (British East Africa: Nairobi and Lukenya). ROUX, 1910, Rev. Suisse Zool., XVIII, p. 101 (Uganda: Busoga). ANDERSSON, 1911, Svenska Vetensk.-Akad. Handl., XLVII, part 6, p. 28 (British East Africa: Nairobi, Thika, and Roiru River). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Uganda: Bussu, Masindi, and Mbale). HEWITT, 1911, Ann. Transvaal Mus., III, part 1, p. 12 (South Africa); Rec. Albany Mus., III, part 2, pp. 209, 222, and 281 (summary of localities with additions from Transvaal and Natal). NIEDEN, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 171 (Lake Region: Kifumbiro). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 321 ("from the Egyptian Sudan to Natal and Angola"). BARBOUR, 1913, Proc. Biol. Soc. Washington, XXVI, p. 149 (Sudan: Abiad). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Rhodesia: Marandellas; Transvaal: Christiana). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 356 (German East Africa, eight localities; British East Africa, three localities; Portuguese East Africa, three localities). WITTE, 1919. Rev. Zool. Africaine, VI, fasc. 2, p. 4 (Partial résumé of above localities with additions: Zami on Lake Tsama, Abyssinia; and MacCarthy Island, Gambia, the most important of these). CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Agouagon, Dahomey; Sediou, French West Africa). WERNER, 1919, Denk. Akad. Wiss. Wien (math.-natur.), XCVI, p. 454 (Anglo-Egyptian Sudan, several localities). Procter, 1920, Proc. Zoöl. Soc. London, p. 413 (British and German East Africa, several localities). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (French Guinea and Libera, several localities).

Phrynobatrachus ranoides BOULENGER, 1894, Proc. Zoöl. Soc. London, p. 644, Pl. XXXIX, fig. 2 (Natal: Pietermaritzburg). SCLATER, 1899, Ann. S. African Mus., I, p. 107 (South Africa). SCHENKEL, 1902, Verh. Naturf. Ges. Basel, XIII, p. 150 (Natal). BOULENGER, 1910, Ann. S. African Mus., V, p. 529 (Natal). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 23 (Kilimanjaro). WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 4 (Résumé with important additions: British Central Africa: Nyika Plateau; Belgian Congo: Pweto on Lake Moero, and Albertville; region of Chari Tchad). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 413 (Mongoro, German East Africa). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (Dixine and Kéronané, French Guinea). WITTE, 1921, Rev. Zool., App. IX, p. 9.

Phrynobatrachus natalensis form *gracilis* ANDERSSON, 1904, in Jägerskiöld, 'Res. Swed. Zool. Exp. to Egypt and White Nile,' I, part 4, p. 10 (White Nile: Grabel-Aish).

Phrynobatrachus boulengeri WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 6 (Portuguese East Africa: Beira and Coguna). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 413 (German East Africa, several localities). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (French Guinea and Liberia, several localities). WITTE, 1921, Rev. Zool., App. IX, p. 10.

One hundred and forty-three specimens: eighty-nine from Faradje, January 1913; eleven from the same locality, October 1912; nine from the same locality, January 1914; one from the same locality, September

1911–January 1912; and one, January 1914; fifteen from Garamba, May–June 1912; eight from Medje, October 1912; five from Vankerckhovenville, April 1912; two from Yakuluku, November 1911; and two from Niangara; June 1913. (A. M. N. H. Nos. 9167–9309.)

Distribution.—*P. natalensis,* although one of the most widely distributed species of African frogs, avoids the forest entirely or barely enters its margin (as at Medje). It ranges all over South Africa, East Africa, and the Sudan, occurring in the west in Gambia just north of the forest and in Angola directly south of the wooded regions. Our records afford further evidence of the uniform distribution of the species in the Sudanese savannahs, where it has not been taken north of Gambia, Lake Chad, and the Province of Sennar in Egypt. *P. natalensis* is a water frog, and its local distribution is more or less dependent on streams. The wide range of the species is indicative of its aggressiveness and adaptability to the varying conditions of African waterways.

Relations.—The specific status of *P. ranoides* has been discussed by Hewitt (1911*b*) and in greater length by Nieden (1915). Both of these investigators have failed to find any character by which to distinguish *P. ranoides* from *P. natalensis.* Witte (1919), in recently revising the genus, has used key characters for *P. ranoides* which fall well within the variability of *P. natalensis* as exhibited by our series. The recorded ranges of the two species coincide and, since I can find no characters with which to distinguish the two species, I have considered them identical.

Four specimens (Nos. 5213–5216) of *P. natalensis* from Cape Colony, received in exchange from the Albany Museum, and two others (Nos. 3192–3193) from Marianhill, Natal, received in exchange from the Durban Museum, are indistinguishable from our fully adult specimens from Faradje. I do not believe that this wide-ranging species can be separated into races. Still, a very young specimen (No. 6684) from Abiad, Dindu River, Sudan, received in exchange from the Museum of Comparative Zoölogy, has a slightly more extensive webbing between the toes than our other specimens of the same size.

Witte (1919) has described as a distinct species the specimens of *P. natalensis* from Portuguese East Africa figured by Boulenger (1907*e*). Several of the specimens in our series agree so well with Boulenger's figure both in the distinctness of the digital dilations and the formation of the dorsal folds that I cannot accept Witte's species. I refer it for the present to *P. natalensis.*

Variation.—The figures given by Boulenger (1907*e*) illustrate the main types of color pattern exhibited in our series. Rough-skinned specimens are generally slate-gray, with or without darker markings and a light vertebral line. Smooth-skinned specimens or those having ridges instead of tubercles above are extremely variable. These showed equally diverse types of coloration in life, the ground tone being any shade from gray to green and the pattern a brownish, yellowish, or greenish. The large series of specimens (Nos. 9167–9253) taken at one time at Faradje may be taken as an illustration of this variability. Mr. Lang described these as follows: "Color varying from a light brown or gray to a dark brown; a vertebral line of different widths present in most of the specimens; color of the vertebral line varying from a pale yellowish or reddish brown to a bright green; a narrow line sometimes present down the center of the broadest vertebral stripes, the latter generally bordered with a dark tone. Many of the specimens with a roughened skin, the raised portions often darker than the general body color. Iris varying from a bronze to a golden. Underside whitish tinged with green; the throat of the male washed with a dark tone."

HABITS.—All of the specimens were taken in the vicinity of pools left by the river or in stagnant ponds near the watercourses. The breeding season appears to be irregular; females with greatly distended ovaries were taken from May to October. A large percentage of the females taken at Faradje, October 1–15, were in this condition. Their ova averaged .7 mm. in diameter and had one hemisphere densely, the other very slightly, pigmented.

The total food content of ten partially full stomachs was 26 soldier and worker termites; 20 worker ants; and 1 caterpillar.

Phrynobatrachus perpalmatus Boulenger

Plate XXIX, Figure 4; XXX, Figure 2; Text Figure 5

Phrynobatrachus perpalmatus BOULENGER, 1898, Proc. Zoöl. Soc. London, p. 479, Pl. XXXVIII, fig. 1 (type locality: Lake Moero); 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Moero). ANDERSSON, 1904, in Jägerskiöld, 'Res. Swed. Zool. Exp. to Egypt and White Nile,' I, part 4, p. 10 (Egypt: El Gerassi). WERNER, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1902 (summary of above localities). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 7 (Stanleyville and Medje, Belgian Congo). WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 6 (summary of the above localities). WERNER, 1919, Denk. Akad. Wiss. Wien (math.-natur.), XCVI, p. 455 (White Nile).

Thirty-three specimens, three of them advanced tadpoles: twenty-six, both adults and larvæ, from Stanleyville, August 1909; three adults from the same locality in March and one in April 1915; two from Niapu, January 1914; and one from Niangara, June 1913. (A. M. N. H. Nos. 9136–9166.)

Distribution.—Werner (1907) has considered the occurrence of *P. perpalmatus* in the Sudan as sporadic. The distribution of the species is, on the whole, peculiar. Very few species of limited distribution occur both in the Rain Forest and on the open savannahs. Our specimens all come from the forest where the species seems to have a rather extended range over the eastern half of the Rain Forest proper and the outlying forest patches.

Relations.—As Witte (1919, p. 2) has indicated in his recent review of the genus, *P. perpalmatus* holds a very distinct position because of its fully webbed toes. The metatarsals are nearly completely separated by the web, a condition found in no other species of *Phrynobatrachus* from the forest. The degree of separation of the metatarsals should not be used alone for generic differentiation, since in other species of *Phrynobatrachus* it has hardly specific value. *P. perpalmatus*, in the structure of its girdle (see above), skull, and tongue, shows a close affinity to that group of species assembled at present partly under *Phrynobatrachus* and partly under *Arthroleptis* but characterized by an unforked or slightly forked omosternum, tarsal tubercle, slender habitus, etc. Unfortunately, material is not available to define properly this group.

Variation.—The majority of the specimens are a chocolate-brown with a light band on each side of the body. The sides of body below these bands are darker than the dorsal surfaces and are stippled with white. The legs are barred with dark brown. A light line runs the length of the hinder surfaces of the thighs. Indistinct dark spots are present on the dorsal surfaces, forming in very young specimens six longitudinal stripes. A narrow vertebral line of white is present in a few of the specimens both young and adult.

There is a distinct sexual dimorphism. Sexually mature males have a yellow tinge to the throat which, although more or less spotted with dark brown, is a very bright yellow in a few of the specimens. This tinge may be very faint, but it is present in all of our adult males, and absent in all of our females. There is no difference in size between the sexes, an average pair (Nos. 9136–9137) measuring 26 and 24 mm. respectively from snout to vent. Several of the females are a little longer, the largest being 28 mm. in length.

The three advanced larvæ in the collection are not in a good state of preservation, having lost their horny mouth-parts. Their coloration is nearly a uniform brown with some indication of a vertebral and dorsolateral line of white. The spiraculum of the smallest specimen (12.5

mm. from snout to vent; 36 mm. from snout to tip of tail) is sinistral, heavily pigmented and extends beyond the body for about a millimeter in the form of a tube slightly fringed at the tip.

HABITS.—*P. perpalmatus*, as indicated by the extensive webbing between the toes, is essentially a water frog. All of our specimens were found near brooks or fresh-water swamps. At Stanltyville the species was: "common in a waterhole near the station, also in the grassy swamps nearby; very clever in concealing itself."

The breeding season may occur in June. At least, only those females taken during that month possessed greatly distended ovaries. Eggs removed from such individuals were a trifle less than a millimeter in diameter and were completely pigmented.

Only eight stomachs of those examined contained food. This consisted of 7 ants; 3 beetles; 2 spiders; 2 waterbugs; 1 hemipterous insect (*Gerris*); 1 chalcid; 2 larvæ of Odonata; 1 minute gryllid; and two, probably dipterous, larvæ.

Phrynobatrachus plicatus (Günther)

Text Figure 5

Hyperolius plicatus GÜNTHER, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. VII, fig. *C* (type locality: Coast of Guinea).

Phrynobatrachus plicatus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 112 (Coast of Guinea). BOCAGE, 1895, 'Herpétol. Angola,' p. 163 (Loango Coast); 1903, Jorn. Sci. Lisboa, (2) VII, p. 44 (Fernando Po). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 11 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Fernando Po and French Congo: Fernand Vaz); Ann. Mag. Nat. Hist., (7) XVII, p. 373 (Unyoro, Lake Albert Region). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 500 (Cameroon: Efulen, Bipindi and Victoria; Spanish Guinea: Makomo). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 45, figs. 77 and 78 (Cameroon localities of Nieden 1908 and in addition Buea). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 132 (Cameroon, Bitye and Efulen). PERACCA, 1912, Ann. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 7 (Northern Rhodesia). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 7 (Medje, Belgian Congo). WITTE, 1919, Rev. Zool. Africaine, VI, fasc. 2, p. 8 (partial summary of above localities; in addition, Ogowe and Cape St. John, Gaboon, and Oban, Southern Nigeria).

Phrynobatrachus auritus BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 440, Pl. XXVIII, fig. 2 (Benito River, Gaboon). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 410 (Gaboon).

Phrynobatrachus discodactylus BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 7 (Medje, Belgian Congo).

Sixty-three specimens, nearly all adult: eighteen from Boyulu, September 22, 1909; seventeen from Gamangui, February 1910; ten from Medje, April–May 1910; one from the same locality, September 1910; seven from Niangara, June 1913; four from Avakubi, two of which were taken in October 1909, and two in May 1914; three from Stanleyville, February–March 1915; one from each of the following localities: Lukolela, July 1909; Niapu, January 1914, and Akenge, April 1915. (A. M. N. H. Nos. 9048–9110.)

Distribution.—*P. plicatus* has a wide range throughout the Rain Forest. It has been taken as far north and west as southern Nigeria. as far south as the Loango Coast and northern Rhodesia, and as far east as Unyoro in Uganda. Our records from many localities in the Rain Forest tend to show that the species has a uniform distribution throughout this region. The occurrence of the species in the outlying forest patches at Niangara and Unyoro is not surprising but Peracca (1912) has recorded the species far to the south of the Rain Forest. This latter record certainly requires confirmation.

Relations.—In our large series of specimens from the Ituri, the small differences employed by Boulenger (1919) to distinguish *P. discodactylus* from *P. plicatus* disappear entirely and I am unable to recognize the former species as distinct. I have been able to find only the following characters in his description to separate his *P. discodactylus* from *P. plicatus* as usually described. These characters seem insignificant in view of the variation already observed in the latter species (cf. Boulenger, 1903).

(1.) Snout not longer than the eye.
(2.) Nostril a little nearer the end of the snout than the eye.
(3.) First finger a little shorter than the second.
(4.) Skin smooth or finely granular above, a glandular fold above the tympanum.
(5.) Throat of the males with rounded, scattered tubercles.

I have compared our series of eleven topotypes with a series of *P. plicatus* from Bitye and Metet, Cameroon. These four specimens, which must be considered typical *P. plicatus*, show several of the distinguishing features of *P. discodactylus*. In our series of sixty-three specimens from the Congo all five characters show so much variation that it is at once evident that *P. discodactylus* cannot be considered distinct.

Variation.—A statement that *P. plicatus* may or may not possess all the distinguishing characters given for *P. auritus* and *P. discodactylus* by no means covers the total range of variation found in our specimens, The distinctness and form of the dorsal fold, the sharpness of the snout.

the presence or absence of the tympanum have been discussed by others. The tibia varies a little in length, but the leg is never as short as that of *P. acridoides* compared by Boulenger (1919) with his *P. discodactylus.*

It would be useless to attempt a description of the range of color variation in *P. plicatus.* The ground tone may vary from a bright pink to a pale gray, or it may be very dark brown. The tympanic stripe and the dark markings on the back are the most constant features of the pattern, but several of the specimens are nearly a uniform gray. The colors have faded but little in alcohol. The specimens in life showed the same variety of browns, pinks and grays.

HABITS.—It is very probable that the breeding season of *P. plicatus* is irregular. Females of our series show a maximum development of the ovaries early in February (Gamangui, 1910), early in July (Niangara, 1913), late in September (Boyulu, 1909), and early in October (Avakubi, 1909).

Only three of all the stomachs examined contained food. This consisted of 1 beetle; 1 spider; and 1 ichneumonid wasp.

Phrynobatrachus dendrobates (Boulenger)

Plate XXIX, Figure 6; XXX, Figure 4; Text Figures 4 and 5

Arthroleptis dendrobates BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 8 (type locality: Medje, Belgian Congo). WITTE, 1921, Rev. Zool. Africaine, IX, p. 16.

Twenty-five specimens: eighteen from Medje, of which one was taken in March, four in April, and one in June 1910; ten in June and two in July 1914; two from Ngayu, December 1909; two from Gamangui February 1910; two from Niapu, January 1914; and one from near Kamunionge, September 1909. (A. M. N. H. Nos. 9111–9135.)

DISTRIBUTION.—*P. dendrobates,* so recently described as a species of *Arthroleptis,* is apparently confined to the Ituri forest. Our most eastern record is from Ngayu, our most western from Niapu.

RELATIONS.—The species must be referred to *Phrynobatrachus,* although the distinction between this genus and *Arthroleptis* is not at all apparent. I have discussed above the relationships of some of the species at present assembled under the two genera. The natural affinities of all of the species can only be determined by monographic treatment. For the present I have retained the genus *Phrynobatrachus* in its old sense. Boulenger's *A. dendrobates* must be referred to that genus, for the webbing between its metatarsals is at least as extensive as in *P. natalensis,* the type of the genus. The metatarsals of *P. dendrobates* are from

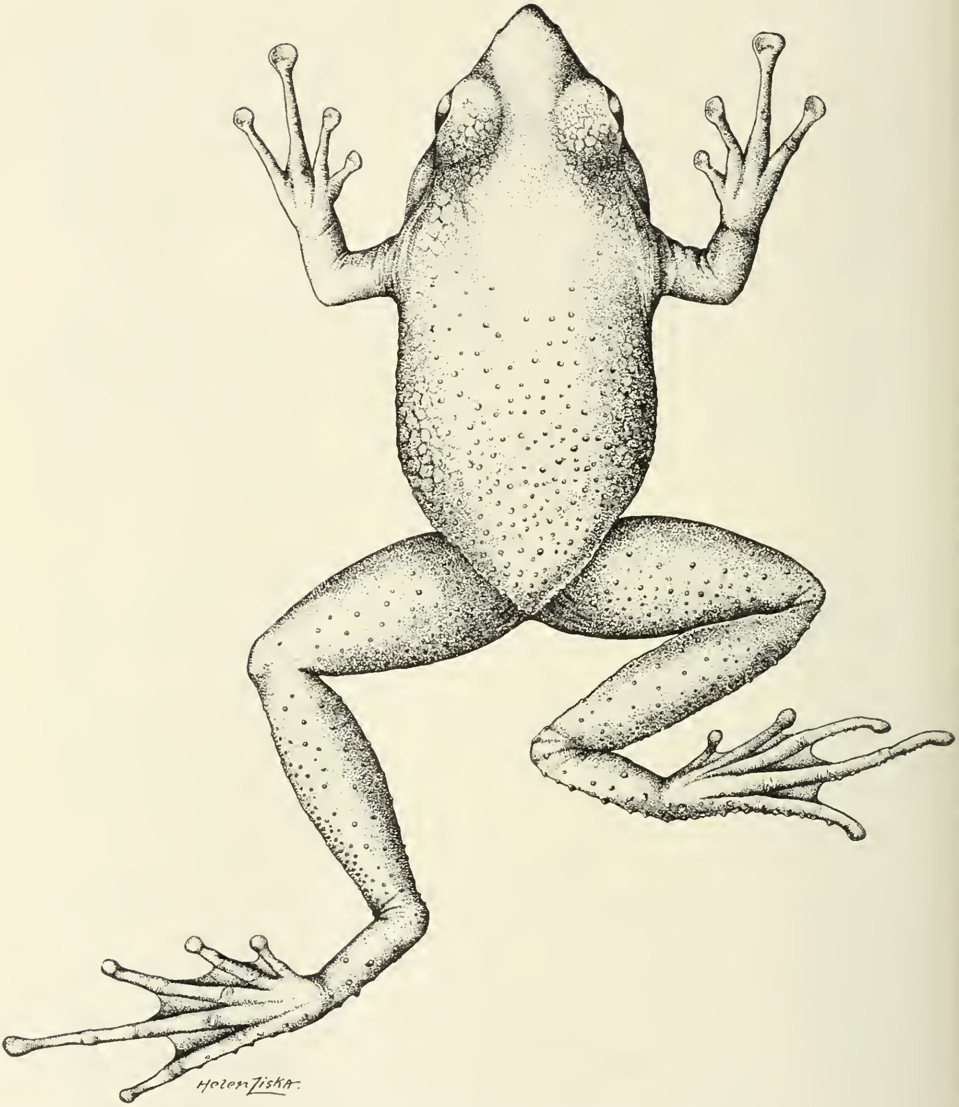
Helen Ziska.

Fig. 4. *Phrynobatrachus dendrobates* (Boulenger), adult ♂.

one-fourth to one-third of their length separated by webbing. The extent of this separation is thus a little less than that of *P. plicatus* (see Fig. 5. But many other features, such as the structure of the pectoral girdle, the form of the body, and terminal phalanges, show that the species finds its closest affinity in *P. plicatus*. Boulenger (1919, p. 9) in referring to his *Arthroleptis dendrobates* admitted that it held a unique position in that genus. It shows some affinity to some of the species at present grouped under *Arthroleptis*, perhaps most to *A. batesii*. But if we are to retain the genus *Phrynobatrachus* in its old sense we must refer the species to that genus.

VARIATION.—The coloration above is generally reddish brown. The black marblings and white spots of the sides of the head and body are often indistinct. The most constant of the light spots is the one under the eye. It may be continued below the tympanum to the shoulder, forming a bright stripe. Several of the specimens show a distinct dorsal pattern. This consists of a dark interorbital bar, a Λ-shaped mark on the back, and crossbars on the legs. The brown throat-and-chest patch is divided longitudinally in the majority of the females by a light line which is lacking or indistinct in the males. One specimen (No. 9135) from near Kamunionge, September 21, 1909, differs strikingly in coloration from all the other specimens in our series. This deviation from the normal coloration is in the direction of one of the color phases of *P. plicatus*. Instead of having a more or less uniform coloration above, the pecimen thas two pale yellowish stripes, one on each side of the body from sthe eye o the groin. The dark area between these two stripes, as well as the dorsal surface of the head, is vermiculated with yellowish brown.

The sexually mature male possesses not only the peculiar rugosities on the hind limbs, as described by Boulenger, but similar tubercles are scattered all over the posterior parts of the body. The distribution of these tubercles is somewhat similar to that found in *Megalixalus spinosus*.

HABITS.—The breeding season of *P. dendrobates* occurs probably in late June. Only females taken during that month possessed greatly swollen gonads. The eggs of several of these specimens (Nos. 9118 and 9128) while still within the ovarium measured approximately 2 mm. in diameter and were heavily pigmented at one pole.

Ten stomachs were found to contain food. In these the food was composed of 2 waterbugs; 2 caterpillars; 1 isopod; 1 fly; 1 cricket; and 1 ant.

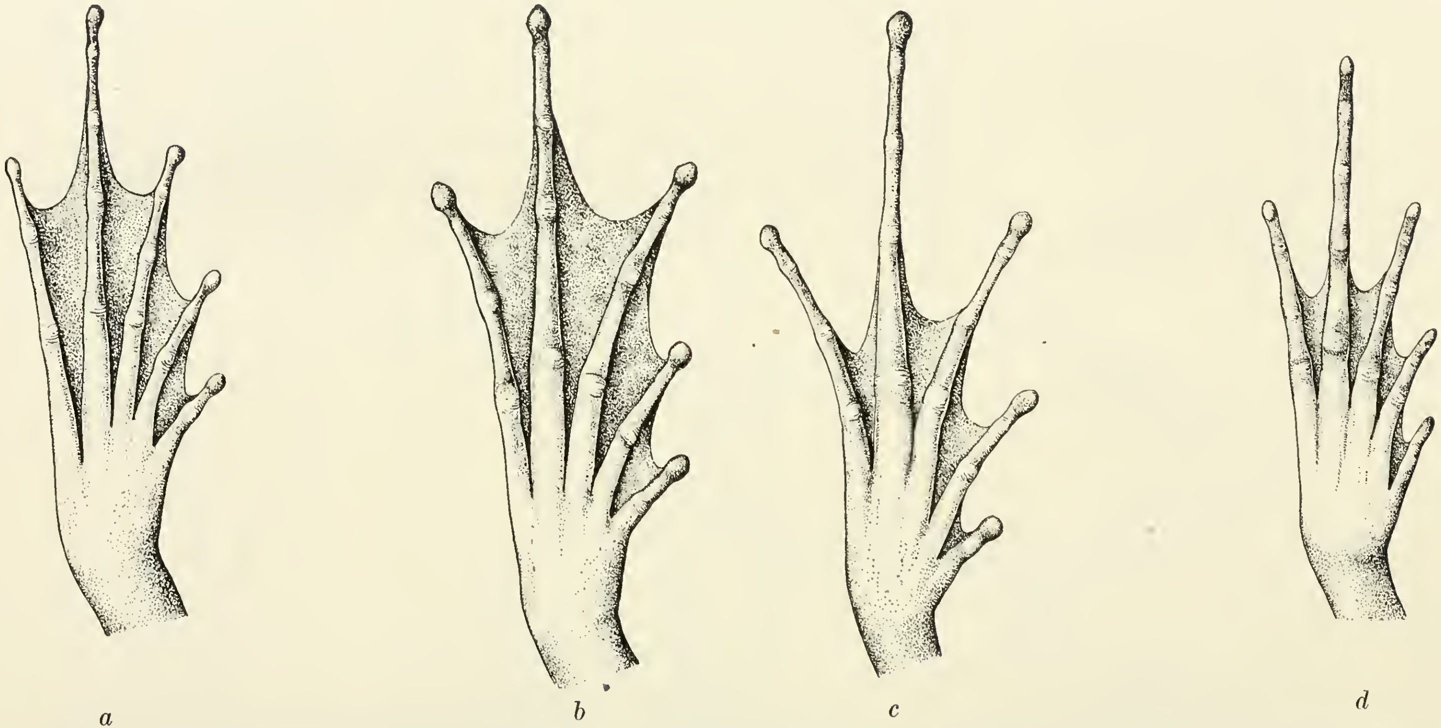

Fig. 5. (*a*) *Phrynobatrachus perpalmatus* (Boulenger), (*b*) *P. plicatus* (Günther), (*c*) *P. dendrobates* (Boulenger), and (*d*) *P. natalensis* (A. Smith). Left hind feet, dorsal aspect, comparing the webbing of metatarsal region.

ARTHROLEPTIS Smith

Only thirty five of the numerous described species of *Arthroleptis* are probably distinct. Most of the species are very little known and their ranges may not be so restricted as it would seem from the check list. The recognizable African species of *Arthroleptis* may be distinguished by the following key. The recently described species, *A. lameeri, A. boulengeri, A. schoutedeni,* and *A. procteræ* have been distinguished by a key (Witte, 1921) and for the sake of brevity are not included below.

*a*₁.—One metatarsal tubercle, no tarsal tubercle, toes free or with a slight rudiment of web; third finger greatly elongated in males.
  *b*₁.—Tympanum hidden. . . . . *A. schebeni.*
  *b*₂.—Tympanum distinct.
    *c*₁.—Tibiotarsal articulation not reaching beyond tympanum; tips of fingers and toes slightly dilated.
      *d*₁.—First finger as long as second.
        *e*₁.—Metatarsal tubercle much shorter than inner toe. *A. wahlbergii.*
        *e*₂.—Metatarsal tubercle as long as inner toe.
          *f*₁.—Tongue papilla present. . . . . *A. stenodactylus.*
          *f*₂.—Tongue papilla lacking. . . . . *A. lönnbergi.*
      *d*₂.—First finger shorter than second.
        *e*₁.—Tips of digits swollen.
          *f*₁.—Skin tubercular above, tubercles forming three series. *A. spinalis.*
          *f*₂.—Skin smooth above.
            *g*₁.—Snout pointed, projecting beyond mouth, tympanum two-thirds diameter of eye. . . . . *A. xenochirus.*
            *g*₂.—Snout rounded, tympanum half diameter of eye. *A. lightfooti.*
        *e*₂.—Tips of digits dilated into distinct disks. . . . . *A. schubotzi.*
    *c*₂.—Tibiotarsal articulation reaching eye or between eye and tip of snout.
      *d*₁.—First finger as long as or nearly as long as second.
        *e*₁.—Digital expansions produced into a point. . . . . *A. xenodactylus.*
        *e*₂.—Digital expansions not pointed, often indistinct.
          *f*₁.—Metatarsal tubercle as long as inner toe. . . . *A. variabilis.*
          *f*₂.—Metatarsal tubercle shorter than inner toe.
            *g*₁.—Habit stout, body depressed. . . . . *A. adolfi-friederici.*
            *g*₂.—Habit slender, body not or but little depressed.
              *h*₁.—Head not wider than body, generally much narrower. . . . . *A. pœcilonotus.*
              *h*₂.—Head wider than body. . . . . *A. carquejai.*
      *d*₂.—First finger much shorter than second.
        *e*₁.—Tips of fingers and toes very strongly dilated. . . . . . *A. reicheri.*
        *e*₂.—Tips of fingers and toes distinctly but not strongly dilated. *A. tæniatus.*

- *a_2*.—Two small metatarsal tubercles and a third tubercle on the tarsus; toes with at least a distinct rudiment of a web, third finger not longer in male than in female.
  - *b_1*.—Toes one-third webbed or less.
    - *c_1*.—Toes less than one-fourth webbed.
      - *d_1*.—A conical or spine-like tubercle on upper eyelid.....*A. calcaratus.*
      - *d_2*.—No such tubercle.
        - *e_1*.—Inner metatarsal tubercle nearer to tarsal tubercle than to outer one..............................*A. batesii.*
        - *e_2*.—Inner metatarsal tubercle equally distant from or farther away from tarsal tubercle than from outer metatarsal tubercle.
          - *f_1*.—Skin smooth above.
            - *g_1*.—Snout a little shorter than diameter of orbit. *A. minutus.*
            - *g_2*.—Snout a little longer than diameter of orbit. *A. werneri.*
          - *f_2*.—Skin warty above.
            - *g_1*.—Tubercles confluent in shoulder region to form indistinct folds...................*A. scheffleri.*
            - *g_2*.—Tubercles not so confluent.
              - *h_1*.—A median stripe...............*A. gutturosus.*
              - *h_2*.—No median stripe.
                - *i_1*.—Tibio-tarsal articulation reaching end of the snout.................*A. fraterculus.*
                - *i_2*.—Tibio-tarsal articulation not reaching snout. *A. tokba.*
    - *c_2*.—Toes more than one-fourth but not more than one-third webbed.
      - *d_1*.—Tips of digits very slightly swollen................*A. parvulus.*
      - *d_2*.—Tips of digits dilated into distinct disks.
        - *e_1*.—Inner metatarsal tubercle considerably nearer to outer than to tarsal tubercle.........................*A. dispar.*
        - *e_2*.—Inner metatarsal tubercle nearly equally distant from outer and from tarsal tubercle...............*A. feæ.*
  - *b_2*.—Toes more than one-third webbed.
    - *c_1*.—Tips of digits very slightly swollen.
      - *d_1*.—Tibiotarsal articulation reaching end of snout........*A. moorii.*
      - *d_2*.—Tibiotarsal articulation reaching eye.................*A. bottegi.*
    - *c_2*.—Tips of toes dilated into very distinct disks.
      - *d_1*.—Distance between the two metatarsal tubercles considerably less than distance between inner and tarsal tubercles..*A. ogoensis.*
      - *d_2*.—Distance between the two metatarsal tubercles more than distance between inner and tarsal tubercles.............*A. rouxi.*

Arthroleptis feæ Boulenger

Plate XXIX, Figure 3

Arthroleptis feæ BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 161, Pl. I, figs. 4–6 (type locality: Prince's Island, West Africa). CHABANAUD, 1921, Bull. Com. et Hist. et Sci. A. O. F., p. 454 (N'Nébéla, French Guinea).

Sixteen specimens: Faradje, one in February and one in March 1911, seven in October 1912; Stanleyville, five in August 1909; Avakubi, two in January 1914. (A. M. N. H. Nos. 8979–8984; 9037–9046.)

Distribution.—It was indeed surprising to find this species in the collections made at so great a distance from the type locality. Our specimens from Stanleyville and Faradje suggest that the species is a wide-ranging forest form.

Relations.—*A. dispar*, the nearest relative of *A. feæ*, is known from Saint Thomas and the Loango Coast. It is probable that the ranges of the two species do not overlap. *A. parvulus*, with which *A. feæ* has much in common, has also an adjacent, not overlapping range. These facts argue for the close affinity of the three species.

Variation.—Our specimens agree in structural detail with the original description except for one feature, The tibiotarsal articulation, extended forward, reaches to the anterior border of the eye or to the nostril and not just to the eye as stated by Boulenger. After the variation I have found in the leg length of other species of *Arthroleptis* I have regarded this discrepancy as due to only individual variation.

In five of our six specimens the dominant tone is grayish brown and not dark brown as the type series. Our specimens show equally as much variation as the specimens figured by Boulenger (1906, Figs. 4, 5, and 6). The white vertebral line is present in only one specimen. Three of the specimens agree among themselves in having the ground tone above a grayish brown with an irregular W-shaped mark of dark brown on the scapular region. In two of these specimens a few dark spots are present on the posterior part of the back, and crossbars appear on the legs. The specimen (No. 8984) taken at Faradje differs from the others in being nearly uniform dark brown above.

Our specimens average a trifle larger than the types, our largest female being 18 mm, in length and our largest male, 15 mm. These specimens are sexually mature.

Habits.—The five specimens taken at Stanleyville were "found hopping on the ground in an old coffee plantation." Two of these, taken August 12, 1909, had their ovaries greatly distended with completely pigmented ova, averaging about .6 mm. in diameter. The stomachs of three of the specimens contained food, which amounted to only 2 ants and 1 beetle.

Arthroleptis parvulus Boulenger

Arthroleptis parvulus Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 109, Pl. IV, figs. 3–3*b* (type locality: Bange Ngola, northeastern Angola).

Three specimens: two from Matadi, June 1909, and one from Zambi, June 1915. (A. M. N. H. Nos. 8976–8978.)

Distribution.—This species, hitherto known only from the type series, seems to have a very restricted range in the savannahs of northern Angola and western end of the Belgian Congo. It is essentially a continuous range limited by the forests on the north and by the arid regions on the south.

Relations.—*A. parvulus*, *A. feæ*, and *A. dispar* form a distinct group of phrynobatrachoid species distinguished from the other groups of species referred to *Arthroleptis* by a combination of the following characters: slender form, tarsal tubercle, short webs, and unforked omosternum. *A. parvulus* may be synonymous with *A. dispar*, but I have considered them distinct on the basis of the distinguishing characters given by Boulenger (1906, p. 164).

Variation.—One of our specimens (No. 8976) is practically identical with one of the type specimens (cf. Boulenger, 1905*a*, Fig. 3) but the only other adult in our series is different not only in color but in limb proportions. Boulenger, in his original description, gives the tibiotarsal articulation as reaching the eye. In one of our specimens it reaches the anterior border of the eye, but in the other it extends to the end of the snout. A careful comparison of the specimens shows that this difference of leg-length is due almost entirely to a difference in tibia length. The tibia of the first is contained in the head and body length almost two times while the tibia of the second is contained 1.77 times. These two specimens differ structurally in no other way and, in view of the variability in the length of the tibia of *A. pœcilonotus* and *A. variabilis*, I feel sure that this difference has no special significance.

The coloration of the longer-legged specimen does not agree entirely with that given in the original description. Its chief features are: ground color above, a brownish gray blotched with dark gray, the blotches forming an indistinct hour-glass-shaped mark on the shoulder region; a narrow, vertebral line of white continued along the posterior surfaces of the thighs by a broader line of the same color; yellowish white below, the throat and sides of the body stippled with brown.

A broad grayish area edged with black extends the length of our smallest specimen which is only 9 mm. from snout to vent. This pattern is identical to one figured by Boulenger (idem, Fig. 3) for the adult and found in one of our adult specimens (No. 8976).

HABITS.—Two stomachs contained food, consisting of 2 minute beetles and 1 ant.

Arthroleptis xenodactylus Boulenger

Plate XXIX, Figure 7

Arthroleptis xenodactylus BOULENGER, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 496 (type locality: Amani, German East Africa). NIEDEN, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 447 (Amani, German East Africa). WERNER, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 321 (German East Africa). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 361 (Amani, German East Africa). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 8 (Medje, Belgian Congo).

A single adult female from Medje, June 30, 1910. (A. M. N. H. No. 8975.)

DISTRIBUTION.—Boulenger (1919) has recently reported this species from the very locality where our single specimen was found. The species apparently has a restricted range in the eastern end of the Rain Forest and the forest outlyer of Usambara.

RELATIONS.—*A. xenodactylus* is readily distinguishable from the other forest species of *Arthroleptis* by the pointed disks of the digits. The tongue of our only specimen is badly damaged and I have not been able to confirm the observations of others as to the absence of the median papilla. Still, there is present in this specimen at the extreme anterior end of the tongue a pair of small papillæ which may or may not be homologous to the median one of other forms. *A. xenodactylus* is similar to *A. pœcilonotus* in body form. I have referred above to the general relationships of these species.

VARIATION.—Our specimen differs somewhat from the type but, in view of the variability of related species, these differences cannot warrant specific distinction. The tibiotarsal articulation of our specimen reaches only the eye. The tibia is contained into the head and body length 1.9 times. The nostril is nearer the end of the snout than the eye, and the tympanum is a little more than half the diameter of the eye. Our specimen differs most strikingly from the type in color. The type was described as "brown above; loreal region dark brown; lower parts white, finely speckled with brown."

In our specimen the dorsal surface of the thighs and a broad patch on the sides of the belly is a pale yellowish. The dark loreal stripe is continued well in back of the tympanum. The brown speckling of the lower surfaces is confined to the gular regions.

The specimen was described in the field as "ground tone above a brownish gray, lighter on the snout; a few dark spots behind the eyes and on the back; on each side of the head a black line extending from the tip of the snout to somewhat beyond the tympanum; limbs gray stippled with a lighter tone; anterior portions of the thighs reddish, the color extending partly over the dorsal surfaces."

HABITS.—The single specimen was taken on the forest floor. Its stomach contained no food. What little is known about the habits of *A. xenodactylus* has been briefly stated by Werner (1912).

Arthroleptis bottegi Boulenger

Arthroleptis bottegi BOULENGER, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 16, Pl. IV, fig. 3 (type locality: Auata, Somaliland); 1896, (2) XVII, p. 14 (Gallaland: Tumpé, Hauacio, Degagolla); 1897, (2) XVII, p. 280 (Somali and Gallaland); 1898, Proc. Zoöl. Soc. London, p. 475 (Somaliland). PERACCA, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 177 (Uganda: Toro). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 24 (Kilimanjaro: Kibonoto). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Bussu, Uganda). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VIII, p. 362 (Kilimanjaro: Kibonoto).

A single adult female, 29 mm. in length, from Garamba, May 1912. (A. M. N. H. No. 9047.)

DISTRIBUTION.—The discovery of this single specimen at Garamba extends the known range of *A. bottegi* farther westward into the Sudanese savannah areas. The species, although widely distributed in northeast Africa, is best known from Somaliland.

RELATIONS.—After the great variation of leg-length I have found in certain species of *Arthroleptis* discussed in this paper, it seems highly improbable that *A. moorii* is distinct from *A. bottegi*. Still, the known ranges of these two species are adjacent, not overlapping, and a few minor points of difference may be found in the original descriptions. *A. moorii* is known to me only from the description and I have not considered it advisable to refer to it the synonymy of *A. bottegi* at this time.

VARIATION.—Our specimen is a uniform olive-gray above with a light vertebral line narrowly edged with a dark tone. The sides of the body are indistinctly mottled with dark gray and irregular bars of the same color appear on the legs. The ventral surface is pale yellowish, lightly stippled on the throat and marbled on the chest with a dark brown.

HABITS.—The ovaries of our specimen are greatly distended with ova. It seems probable that the breeding season may occur about the time our specimen was taken or a little later, e.g., May or June. Nothing is known about the food habits of this species of *Arthroleptis*.

Arthroleptis pœcilonotus Peters

Arthroleptis pœcilonotus Peters, 1863, Monatsber. Akad. Wiss. Berlin, p. 446 (type locality: Boutry, Coast of Guinea). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117 (same locality as above). Matschie, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togo). Boulenger, 1890, Proc. Zoöl. Soc. London, p. 324 (Gold Coast); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 161 (Fernando Po, Portuguese Guinea: Bolama and Rio Cassini; French Congo: Fernand-Vaz, Lambaréné and N'Djole); 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 320. Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 501 (Cameroon: Buea, Victoria, Bipindi, Johann-Albrechtshöhe, and Ebolowa). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). Nieden 1910, Arch. Naturg., LXXVI, part 1, p. 242 (Bamenda, Cameroon); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 50, fig. 97 (localities of Nieden 1908 and in addition, Bibundi, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 213 (Mowange, Cameroon). Boulenger, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria). Chabanaud, 1919, Bull. Mus. Nat. Hist., Paris, p. 457 (Dahomey).

Arthroleptis macrodactylus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117, Pl. xi, fig. 5 (Gaboon); 1885, Zoöl. Record, Rept., p. 23. Günther, 1893, Proc. Zoöl. Soc. London, p. 620 (Nyasaland). Bocage, 1896, Jorn. Sci. Lisboa, (2) IV, p. 104 (Nyasaland). Johnston, 1897, 'British Central Africa,' p. 361*a* (Nyasaland). Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 144 (Cameroon). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 441 (Gaboon, Tumbo Island in the Gulf of Guinea, and Nyasaland); 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 13 (Cameroon); 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 236 (Bibundi, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LIV, p. 214 (Bibundi, Cameroon).

Arthroleptis bivittatus F. Müller, 1885, Verh. Naturf. Ges. Basel, VII, p. 671, Pl. ix, figs. *k–l* (Tumbo Island).

Arthroleptis inguinalis Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 442, Pl. xxvii, fig. 2 (Benito River, Gaboon). Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 410 (Gaboon, near Lambaréné). Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Spanish Guinea: Cape St. John). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Efulen, Cameroon).

Arthroleptis pœcilonatus Nickel, 1901, Helios, XVIII, p. 72 (Cameroon). (Misspelling for *A. pœcilonotus.*)

Four specimens: two from Avakubi, October 1909; and two from Medje, July 1914. (A. M. N. H. Nos. 8971–8974.)

Distribution.—*A. pœcilonotus* is well known from the Rain Forest. It has been recorded from the outlying forest "island" of Usambara, and the semi-forested area of Nyasaland. Günther (1893) expressed some uncertainty as to his record of the species from the latter region. The occurrence of the species so far south of the Rain Forest requires confirmation. The records seem to show that *A. pœcilonotus* is a typical forest species which may or may not occur in the various stretches of forest which lie beyond the Rain Forest proper.

Relations.—*A. pœcilonotus* is a well-defined species belonging to the *typica* group of *Arthroleptis*. This group is distinguished chiefly by its widely forked omosternum, slight indication of a web between the toes, and the elongate third finger in the males. *A. pœcilonotus* is a smaller and more slender frog than *A. variabilis*, with which it has many features in common. It is also closely related to *A. carquejai*. This species was only briefly described, but judging from the figure (Ferreira, 1906, plate facing p. 159) it has a darker and much more heavily spotted throat than any specimen of *A. pœcilonotus* which I have examined.

Variation.—Several investigators have remarked on the variability of this species. Our series, three adult males and one young individual (male ?), shows that this variability is not limited to color. The two specimens (Nos. 8971–8972) from Avakubi measure 22 mm. and 20 mm. respectively in length (snout to vent), and yet the first has a tibia 10 mm. in length and the second, 11 mm. Thus the relative difference of the length of the tibia compared to the length of the body of these specimens is 2.2 to 1.8. The two specimens from Medje and two others (Nos. 3140 and 6694) from Cameroon have the tibia proportionately intermediate in length.

One of the adult males from Medje is very warty above, while the other is nearly smooth. They are both chestnut-brown in color, delicately marbled with black. A broad triangle between the eyes, a series of confluent spots posterior to it, and a number of crossbars on the legs are the most conspicuous of these markings.

The two specimens from Avakubi are both ashy gray above marked with blackish, very similar to the Medje specimens. In life these patterns were distinct but the ground tones were different. The smaller specimen was described in the field as "whitish gray above, faintly marbled with darker; silvery gray below with a white area on the abdomen." The larger specimen, on the other hand, was found to be "pale green above with irregular dark markings; whitish below, translucent on the throat and hind limbs."

Habits.—Nothing is known of the habits of this species of *Arthroleptis*. Related forms have been found in the vicinity of forest pools. Only one stomach contained food. This consisted of three ants and fragments of a fly or beetle larva.

Arthroleptis variabilis Matschie

Plate XXIX, Figure 5; XXX, Figures 1, 3; XXXII, Figure 1

Arthroleptis variabilis Matschie, 1893, Sitzber. Ges. Naturf. Freunde Berlin, p. 173 (type locality: Buea and Barombi, Cameroon). Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 193 (Buea, Cameroon); 1899, XLIX, p. 144 (Victoria, Cameroon). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 441 (Fernando Po, Cameroon and Gaboon). Schenkel, 1902, Verh. Naturf. Ges. Basel, XIII, p. 150 (Cameroon). Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 14 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Buea, Cameroon and Fernando Po). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 502 (Cameroon: Buea, Victoria, Johann-Albrechtshöhe, Ebolowa, Bipindi, and Loppo). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). Nieden, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 50, figs. 93–96 (localities of Nieden 1908 except Loppo, and in addition Bibundi, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Kribi, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 213 (Cameroon: Bibundi, Isongo, and Mowange). Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 452 (Dixine and Keronané, French Guinea).

Arthroleptis dispar Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117 (part: West Africa). (Not of Peters, 1870.)

Atthroleptis variabilis var. *tuberosa* Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 14 (Cameroon).

Fifty-two specimens: twenty-eight from Akenge, September and October 1913; fourteen from Medje, five of which were taken in March 1910, five in April–May 1910, two in September 1910, one in June 1914, and one in July 1914; seven from Gamangui, February 1910; and one from each of the following localities: Faradje, November 1911, Vankerckhovenville, April 1912, and Avakubi, November 1913. (A.M.N.H. Nos. 8985–9036.)

Distribution.—*A. variabilis* represents still another Cameroon species found abundantly in the Ituri. Like many of these wide-ranging forest forms, it also occurs in the forested areas lying beyond the Rain Forest proper.

Relations.—Nieden, (1912) has considered his *A. adolfi-friederici* distinct from *A. variabilis* on the basis of its shorter metatarsal tubercle. This structure shows some variation in our large series. It averages a little longer than the inner toe, but several of the specimens have it a little shorter. Nieden's largest specimen of *A. adolfi-friederici* was only one millimeter larger than our largest specimen of *A. variabilis,* and his type was about the average of our adult females. Whatever might be the true status of *A. adolfi-friederici,* I would, for zoögeographic reasons, regard the specimen recorded by Nieden (*loc. cit.*) from Avakubi as *A.*

adolfi-friederici as actually referable to another species. It should have been referred to either *A. pœcilonotus* or *A. variabilis.* Without the specimen at hand, it would be difficult to say which. Its small size at sexual maturity makes it seem probably referable to the former species.

VARIATION.—The great variation in color of *A. variabilis* has been commented upon by Peters (1875), Matschie (1893), Werner (1898), Andersson (1905), Nieden (1910*a*), and others. Our series shows considerably more uniformity than some of the series discussed by these investigators. Most of the specimens are nearly uniform reddish brown above, paler on the snout, and faintly mottled on the sides of the body. The black tympanic stripe is always more or less distinct. The throat is generally marbled with dark brown. A light vertebral stripe is often present.

The specimens have faded but little in alcohol. One specimen (No. 9002) from Gamangui, February 13, 1910, was described in the field: "Dorsal surface brownish gray, paler on the head; a dark bar between the eyes; legs crossbarred with dark brown; throat mottled with gray, a light median line dividing it horizontally; abdomen grayish with blue green tints, becoming pinkish on the under surface of the thighs; iris golden."

HABITS.—An examination of the sexual organs of our series of specimens has led me to infer that the breeding season may occur in June and July. This inference is based on negative rather than positive evidence since our series of specimens taken during those months is limited.

Of those stomachs examined seventeen contained food, consisting of 400 winged termites; 6 soldier and worker termites; 1 winged and 8 worker ants; 5 snails (*Helixarion*); 5 caterpillars; 3 roaches; 2 spiders; 1 myriopod (Julidæ); and 1 beetle.

CARDIOGLOSSA Boulenger

Plate XXXII, Figure 2

This genus, which has been defined as a toothless *Arthroleptis*, is restricted in range to the Rain Forest. It includes five species which may be distinguished as follows:

a_1.—Digits dilated into distinct disks.
    b_1.—Toes half webbed...*C. dorsalis.*
    b_2.—Toes much less than half webbed...............................*C. elegans.*
a_2.—Digits only slightly dilated.
    b_1.—Tibiotarsal articulation reaching to tympanum or eye.
        c_1.—Metatarsal tubercle as long as first toe; interorbital space much wider than upper eyelid...*C. escaleræ.*

c_2.—Metatarsal tubercle a little shorter than inner toe; interorbital space only slightly wider than upper eyelid..................*C. leucomystax.*

b_2.—Tibiotarsal articulation reaching end of snout or beyond.......*C. gracilis.*

Cardioglossa leucomystax (Boulenger)

Plate XXXII, Figure 2

Arthroleptis leucomystax Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62, Pl. v, figs. 1 and 2 (type locality: Cape St. John and the Benito River, Spanish Guinea; and Kribi, Cameroon).

Cardioglossa leucomystax Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321. Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 506 (Cameroon: Victoria, Jaunde, and Johann-Albrechtshöhe); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 62, figs. 132 and 133 (localities of Nieden, 1908, and in addition Kribi, Cameroon). Boulenger, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria).

Cardioglossa leucomystax var. *nigromaculata* Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 506 (Johann-Albrechtshöhe, Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 63, fig. 133 (Bamenda and Johann-Albrechtshöhe, Cameroon); Arch. Naturg., LXXVI, part 1, p. 245 (Bamenda, Cameroon); 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 182, Pl. v, figs. 6 and 7 (Forest 90 km. west of the south end of Lake Albert Edward).

Seven specimens: one from Medje in April–May 1910, one in March 1914, and two in June 1914; one from Gamangui, February 1910; one from Batama, September 1909; and one without an exact locality. (A. M. N. H. Nos. 9310–9316.)

Distribution.—*C. leucomystax* is essentially a forest frog. Our locality records tend to show that the species has a wide distribution throughout the Rain Forest. The fact that our specimens were taken singly and mostly by accident is indicative of the secretive nature of the species, which is indeed very little known.

Relations.—It is difficult for me to believe that *C. escaleræ* is really distinct from *C. leucomystax*. The two unimportant characters which I have used in the key are the only diagnostic ones in the original descriptions. The former species was described with toes free, while the latter with toes provided with a rudiment of a web. This apparent difference disappears in our series, where the rudiment of a web is sometimes fleshy and indistinguishable from the metatarsal region.

Variation.—The metatarsal tubercle shows so much variation in our series that its size can hardly be used as diagnostic of *C. escaleræ*. In one specimen (No. 9316) it is about one-third as long as the inner toe, while in another (No. 9315) it is nearly as long as that structure.

In view of the several color variations found by Nieden, our series shows great uniformity. The pattern in all of the specimens is practically identical with that well shown in the photograph (Plate XXXII, fig. 2).

The ground tone above varies from a pale gray to an olive-brown. The lateral spots very in shape but their arrangement is very much the same in all the specimens. The specimen (No. 9310) shown in the photograph was described in life: "dark brown above with indistinct tracing of pale lines; sides of the body heavily spotted with large dark blotches outlined with pale blue; sides of the head washed with the same dark tone, bordered below by a whitish line; throat brownish speckled with pale blue; abdomen marbled with dark brown and pale blue; appendages indistinctly crossbarred with dark brown; iris dark brown, the upper third golden."

HABITS.—The breeding season may occur in June, for only the specimens taken during that month are sexually mature. It is probable that the larval period is more or less abbreviated, for mature eggs taken from the ovaries are 2.5 mm. in diameter and are unpigmented. Nothing is known about the habits of the species. All of our specimens were taken in the forest and mostly by natives.

Only three stomachs of those examined contained food. This was composed entirely of termites: 82 soldiers and workers were counted.

Cardioglossa gracilis Boulenger

Cardioglossa gracilis BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 445, text fig. 2 (type locality: Benito River, Gaboon). WERNER, 1901, Verh. Zool.-Bot. Ges. Wien, LI, p. 634 (same locality). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Cape St. John, Spanish Guinea). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 244 (Bibundi, Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 507; 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 63 (between the Cameroon mountains and Rio del Rey). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., LIV, No. 2, p. 135 (Ja River, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 217 (Bibundi, Cameroon).

A single immature female from Boyulu, September 22, 1909. (A. M. N. H. No. 9317.)

DISTRIBUTION.—*C. gracilis,* formerly known only from the Cameroon-Gaboon area, will probably be shown to have the same wide range in the Rain Forest as *C. leucomystax,* to which it is closely related, if not identical.

RELATIONS.—Two closely related species rarely ever occupy the same range, a fact which lends support to my opinion that the species may be identical. The only real difference I can find between them is the distinctly greater leg-length of *C. gracilis,* a difference we have seen to have little specific value in various species of *Arthroleptis,* the prototype of *Cardioglossa.* Our single specimen of *C. gracilis* has the tibiotarsal articulation extending beyond the snout, but in every other way it is identical to *C. leucomystax.* Our specimen is only 26 mm. long. In most species of *Phrynobatrachus* and *Arthroleptis* the young individuals exhibit greater variation in leg-length than fully adult ones. None of the specimens of *C. leucomystax* in our series show any intermediate condition, and I have considered it advisable to keep *C. gracilis* and *C. leucomystax* distinct for the present.

VARIATION.—The coloration of our specimen is practically identical to that of *C. leucomystax* as figured by Boulenger (1903, Pl. v, fig. 2), In other words, the dorsal pattern, indistinct in our series of *C. leucomystax,* is in this specimen very sharp. The dark lateral blotches, however, were outlined in life with yellow instead of pale blue as in *C. leucomystax* and the ground tone above was a pale gray instead of a dark brown.

HABITS.—Our specimen was caught in the forest at Boyulu near the road. Its stomach contained the fragments of several ants.

RANA Linnæus

Boulenger has for some time had in preparation a revision of this genus. He has indicated (1918) that the genus might be divided into a number of subgenera characterized by differences in the skull, pectoral girdle, and metatarsal region. Procter (1919) has contributed some support to Boulenger's view. Equally important differences of skull and metatarsal region are known in many other genera but these differences have not been considered of subgeneric value in these latter cases. The genus *Hyla* may be taken as an example. *Smilisca* has a very definite and peculiar skull-form but that genus is generally merged into *Hyla* without even subgeneric distinction. The form of the omosternum has been shown above to be characteristic of groups of species of *Arthroleptis.* The characters upon which Boulenger bases his subgenera of *Rana* are apparent in the material I have examined, but it would be inconsistent to recognize with a name these differences in *Rana* and disregard those in *Arthroleptis.* Until the use of subgenera becomes more universal in herpetology it is at least conservative to disregard them in our discussion.

In view of Boulenger's forthcoming monograph, no attempt has been made to construct a key to the African species of *Rana.* The check list indicates what species are generally considered valid. My conclusions do not agree entirely with those of Boulenger. Witte (1921) has published a translation of part of Boulenger's forthcoming key.

Rana occipitalis Günther

Plate XXXIV, Figure 2

Rana occipitalis Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 130, Pl. xi (type localities: "West Africa," "Africa," and Gambia). Boulenger, 1882, 'Cat, Batr. Sal. Brit. Mus.,' p. 27 (Angola and the above localities). Sauvage, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, French Congo). Müller, 1885, Verh. Naturf. Ges. Basel, VII, pp. 275 and 670 (Tumbo Island and Senegambia). Günther, 1888, Proc. Zoöl. Soc. London, p. 51 (Monbuttu, Belgian Congo). Büttikofer, 1890, 'Reisebilder aus Liberia,' II, pp. 444 and 478 (Liberia). Boettger, 1892, 'Kat. Batr. Mus. Senck.,' p. 3 (Senegal). Matschie, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togoland). Bocage, 1895, 'Herpétol. Angola,' p. 155 (Littoral and northern Angola: Duque de Bragança, Dondo, Ambaca, Novo Redondo, and Catumbella); 1896, Jorn. Sci. Lisboa, (2) IV, p. 80 (Portuguese Guinea). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 91 (Kakoma, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p 65 (German East Africa); 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 299 (German East Africa). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Bissau, Portuguese Guinea). Johnston, 1906, 'Liberia,' II, p. 833 (Liberia). Werner, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1887 (Sudan: Mongalla). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 495 (Garua, Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 39 (same locality); Arch. Naturg., LXXVI, part 1, p. 241 (Dodo, Cameroon). Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 167 (Bussu, Uganda). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 208 (Senegal). Werner, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 312 (Africa). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 349 (Kakoma, German East Africa and Entebbe, Uganda). Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Timbouctou, French West Africa; Agouagon, Dahomey).

Rana (*Fejérvárya*) *occipitalis* Bolkay, 1915, Anat. Anz., XLVIII, p. 172, figs. 1–3 and 7 (Shirati, German East Africa). (Subgenus used generically for figures but not for text.)

Rana tigrina var. *occipitalis* Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 4 (Poko, Medje, and Albertville, Belgian Congo; also summary of distribution).

Rana tigrina occipitalis Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 450 (French Guinea and Liberia).

Fifty-seven specimens: six from Faradje, February 1911, one from the same locality in February, twenty-three in October and two in November 1912; four from Medje in August and two in September 1910; one from the same locality in April, one in March, and one in June 1914; two from Stanleyville in August 1909, one in March 1910, four in February and two in April 1915; two from Garamba, June 1912; and one from each of the following localities: Mobeka, July 1909; Niangara, November 1910; Poko, July 1913; Zambi, June 1915; and Malela, July 1915. (A. M. N. H. Nos. 10899–10955.)

Distribution.—*R. occipitalis* is a river-frog and its range is not limited to a single vegetation zone. It is a very conspicuous frog, one not easily confused with any other species. Its wide distribution throughout both forest and plains from Senegal and the Sudan in the north to Angola and Tanganyika Territory in the south suggests that few factors beside temperature and drainage control its dispersal.

Relations.—Boulenger (1919) has reduced *R. occipitalis* to a subspecies of *R. tigrina*. *R. occipitalis* is only distinguishable from *R. tigrina* externally by its very distinct occipital furrow. Still, I am not at all convinced that the many differences of skeleton pointed out by Bolkay (1915) are to be attributed solely to individual variation. The ranges of *R. occipitalis* and *R. tigrina* are not contiguous. For the present it seems advisable to return *R. occipitalis* to its specific status.

Variation.—The variation in color pattern is largely dependent on a variation in the ground tone. Young specimens which have generally a light ground tone, are mostly spotted. Older specimens are sometimes a uniform dark greenish gray above, but more often have some indication of the spotting which is very distinct in those with the pale grayish ground tone. The light occipital bar is very distinct in all but the darkest specimens.

One of the darker specimens (No. 10899) taken at Faradje in November 1912 was described in the field: "general color above a greenish brown with darker markings, especially on the limbs; tympanum pinkish brown; throat pinkish gray and creamy markings; abdomen grayish white; sides of the body grayish green with pale yellowish markings along the lower edge; iris bronzy green with numerous fine anastomosing black radiations."

Habits.—*R. occipitalis* was found only in the vicinity of streams, ponds or marshes. It appears to have much the same habits as our bull frog. Its large size enables it to feed on many of the smaller frogs of the region. Four frogs taken from stomachs of four specimens of *R. occipitalis* are unidentifiable but they appear to be young of the same species. One specimen of *R. occipitalis*, 104 mm. long, had a specimen of *R. oxyrhyncha*, 43 mm. long, in its stomach. Another specimen, 117 mm. long, had eaten a *Bufo regularis*, 50 mm. in length. Of special interest was a specimen (No. 10953) 112 mm. in length, from Medje, taken August 29, 1910. It contained in its stomach three specimens of *Hyperolius pusillus* (?) each about 33 mm. from snout to vent.

Twenty-five stomachs were examined. In addition to the 8 frogs and 1 toad mentioned above, they contained 1 crab; 15 beetles; 14

ants; 4 spiders; 2 winged dragon flies and 3 larvæ; 3 termites; 3 crickets; 4 bees (*Ceratina* and *Megachile*); 3 pentatomids (Heteroptera); 2 julids (Myriopoda); 2 mole-crickets (*Gryllotalpa*); 1 horse-fly larva (Tabanidæ) and 1 pupa; 1 isopod; 1 driver ant; 2 snails (*Succinea*, *Limicolaria*); 1 caterpillar; 1 fly; 1 grasshopper; 1 water-bug; 1 lombricid; and a number of leaves.

Rana chapini, new species

Text Figure 6*a*

A single adult male, Batama, September 16, 1909 (A. M. N. H. No. 11260).

Distribution.—*R. chapini* is apparently the forest representative of the *R. nutti*—*R. angolensis* stock. *R. nutti* is known from Abyssinia to western Tanganyika Territory, while *R. angolensis* has been recorded from Angola and Nyasaland southward to the eastern Cape Colony.

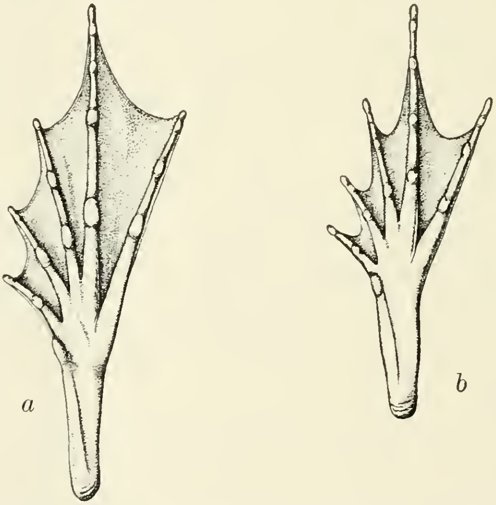

Fig. 6. (*a*) *Rana chapini*, new species, and (*b*) *R. angolensis* Bocage, ventral aspect of foot, showing the difference in the extent of the webbing.

Diagnostic Characters.—Tibiotarsal articulation extending considerably beyond the snout; tibia contained one and a half times in the distance between snout and vent; toes webbed to half the length of the distal phalanges of the third and fifth toes, and to beyond the proximal joint of the penultimate phalanx of the fourth. A single metatarsal tubercle; skin smooth, a dorsolateral fold on each side; no external vocal sacks in the male; size large.

Type.—The only specimen secured.

Description of Type Specimen.—Vomerine teeth in two oblique series extending from the anterior borders of the choanæ to a level with their posterior margins; distance between the two series of teeth equal to about half the length of a single series. Head about a sixth longer than broad; snout obtusely acuminate, projecting slightly beyond the mouth; once and a half as long as the eye; canthus rostralis obtuse; loreal region feebly concave; nostril equidistant from the eye and tip of the snout; the distance between the nostrils greater than the interorbital width which is much less than that of the upper eye-lid; tympanum very distinct, three-fourths the diameter of the eye and two and a half times as wide as the distance between it and the eye. Fingers pointed, first and second equal; subarticular tubercles distinct. Tibiotarsal articulation extending beyond the snout for a distance of half the length of the head; heels strongly overlapping; tibia contained one and a half times in the distance between snout and vent, slightly longer than the foot. Toes pointed, nearly completely webbed, the web extending to the tip of the first and second toes, to more than half the length of the distal phalanges of the third and fifth toes and to beyond the proximal end of the penultimate phalanx of the fourth toe; subarticular tubercles not prominent; an indistinct tarsal fold present, but no tarsal tubercle; inner metatarsal tubercle oval, one-third the length of the inner toe, no outer tubercle. Upper surfaces smooth; a narrow but very distinct dorsolateral glandular fold, extending to the groin on each side; a curved fold from the eye extending over the tympanum to the shoulder; lower surfaces smooth; posterior surfaces of the thighs granular.

Color above uniform dark brown, grayish on the head and indistinctly spotted on the legs; posterior surfaces of the thighs spotted with a darker tone, ventral surfaces yellowish, marbled with brown and white on the throat, chest and sides of the belly. In life, colors much the same but the head suffused with green and not gray.

Vocal sacs internal, not indicated by folds on the sides of the throat.

Measurements

Snout to Vent	78	mm.
Width of Head	21	"
Foreleg	45	"
Hind Leg (Vent to Tip of Longest Toe)	151	"
Tibia	49	"

Relations.—*R. chapini* is most closely related to *R. nutti* Boulenger, which Nieden (1912) has regarded as probably identical with *R. delalandii* Duméril and Bibron (=*R. angolensis* auct.). It is, nevertheless, readily distinguishable from both of these species by its more extensive webbing between the toes. It is very probably a larger frog, for the largest male *R. angolensis* recorded by Boulenger (1918*a*) in his recent critical study of that species is three millimeters smaller than our single specimen of *R. chapini*.

Habits.—Our specimen was taken in the grass bordering the brook at Batama. Its stomach contained fragments of a single beetle and a caterpillar.

Rana albolabris Hollowell

Plate XXXIV, Figure 1

Rana albolabris Hallowell, 1856, Proc. Acad. Nat. Sci. Philadelphia, p. 153 (type locality: West Africa). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 59, figs. 2, 2*a*, and 2*b* (Gaboon and Fernando Po). Sauvage, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Gaboon). Vaillant, 1884, Bull. Soc. Zool. France, IX, p. 353 (Assini, French West Africa). Boettger, 1888, Ber. Senck. Ges., p. 94 (Assini, French West Africa; Akkra, Gold Coast; Abo, Cameroon; Fernando Po; Dongila, Gaboon; Lambaréné on the Ogowe; Chinchoxo, Loango Coast; and Banana, Lower Congo); 1892, 'Kat. Batr. Senck. Ges.,' p. 12 (Banana, Lower Congo). Matschie, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togo). Bocage, 1895, 'Herpétol. Angola,' p. 162 (Lower Congo and the Loango Coast). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 96 (part: Bukoba, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p. 65) (German East Africa); 1898, in Werther, 'Die mittleren Hochländer der nördlichen Deutsch-Ost-Afrika,' p. 300 (German East Africa). Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 7 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Gaboon: Fernand Vaz and N'Djole: Cameroon: Buea; and Fernando Po). Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 229 (Bibundi, Cameroon). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 496 (Spanish Guinea: Makomo; Cameroon: Bipindi, Jaunde, Ebolowa, Longji and Ossidinge). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). Nieden, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 39, figs. 62–63 (Victoria and Cameroon localities of Nieden 1908); 1910, Arch. Naturg., LXXVI, part 1, p. 241 (Dodo, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, p. 130 (Efulen, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 211 (Bibundi and Isongo, Cameroon). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 353 (Entebbe, Uganda; and Bukoba, German East Africa).

Limnodytes albolabris Vaillant, 1884, Bull. Soc. Philom. Paris, (7) VIII, p. 171 (Assini).

Chiromantis lepus Andersson, 1903, Verh. Zool.-Brit. Ges. Wien, LIII, p. 142 (type locality: Cameroon); 1905, Ark. Zool., Stockholm, II, No. 20, p. 9, Pl. I, figs. 1 and 1*a* (Cameroon). Nieden, 1908, Mitt. Zool., Mus. Berlin, III, p. 500 (Cameroon).

Rana albilabris Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 323 (Unyoro, East of Lake Albert) (Emendation to *R. albolabris*); 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands; Victoria Nyanza). Klaptocz, 1913, Zool. Jahrb. (Syst.), XXIV, p. 288 (Mamou French Guinea). Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 1 (Bafwadi, Bafwasikuli, Fundi. Mombaka, and Medje, Belgian Congo).

Rana zenkeri Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 497 (type locality: Bipindi, Cameroon). Barbour, 1911, Bull. Mus. Comp. Zoöl. Cambridge, LIV, p. 130, Pl. I (Efulen, Cameroon).

Rana (Hylorana) albolabris Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 450 (Kerouané, French Guinea and Sanikolé, Liberia).

Ninety-six specimens: thirty-four from Niapu, January 1914; one from the same locality, November 1913; two from Medje in April, nine in June, and six in July 1914; six from the same locality in April–May, 1910; six from Stanleyville in August 1909 and four in April 1915; eight from Niangara, November 1910; two from Avakubi in October 1909 and one in September 1913; three from Faradje, February 1911; two from Nala, July 1913; and one from each of the following localities: Ukaturaka, July 1909; Ngayu. December 1909; Yakuluku, November 1911; Vankerckhovenville, April 1912; Dungu, July 1913; Garamba, July 1912; and Akenge, September–October 1913. (A. M. N. H. Nos. 10992–11087.)

Distribution.—*R. albolabris* is a very characteristic frog of the Rain Forest. Still, its range is not limited to that area. The species has been taken as far east as Bukoba in Tanganyika Territory, and Unyoro and Entebbe in Uganda. Specimens were taken by the expedition as far north as Yakuluku and Garamba. The species has been recorded south of the forest by Boettger (1892). It is probable that swamps and other moist areas have enabled *R. albolabris* to maintain itself in the savannahs beyond the forest.

Relations.—It is only with considerable hesitancy that I have followed Boulenger (1919, p. 4) in referring *R. zenkeri* to the synonymy of this species. The distinguishing characters given by Nieden (1908*a*) are of little value in a large series, but I have examined a number of specimens in the Museum of Comparative Zoölogy from Cameroon which, although not breeding frogs, are considerably larger than our largest sexually mature females of *R. albolabris*. These specimens, between 80 and 90 mm. in length, are much more granular above than any of our specimens, and the width of their head is a little greater. The average of the ten largest specimens of *R. albolabris* in our series is 68.3 mm. from snout to vent (maximum, 73 mm.; minimum, 66 mm.).

Variation.—The ground tone varies in our series from a pale grayish to a dark brown. The dark spots above, the dark blotches below and the light tinge to the lips show various degrees of development. The labial stripe and the dorsal spots are present in the darkest individuals of our series. The labial stripe is not always present in the pale specimens.

Two of our specimens (Nos. 11066–11067) from Faradje, taken February 15, 1911, may be considered typical. They were described in the field as: "grayish green above, with many irregular dark markings, several black bands across the hind limbs; sides of the body pale greenish; the larger specimen metallic blue below, whitish on the belly and pinkish on the appendages, the smaller specimen nearly black below except for the hind limbs which are pinkish."

HABITS.—*R. albolabris* was found at Stanleyville, August 21, 1909, hopping on the ground in a coffee plantation; at Nala, July 1913, it was taken in the tall grass near the swamps; while at Faradje, February 1911, it was chiefly observed in the waterholes with *Xenopus*.

Females which show the maximum degree of development of their ovaries were taken at Stanleyville in August and at Medje in May and June.

Twenty-three of the stomachs examined contained food. The following material was recognizable: 25 ants; 6 caterpillars; 7 beetles; 2 grasshoppers; 2 spiders; 2 snails; 2 myriopods (julids); 1 slug (*Vaginulidæ*); 1 membracid; 1 wasp (Psammocharidæ); and 1 hemipterous insect (Reduviidæ).

Rana mascareniensis Duméril and Bibron

Rana mascareniensis DUMÉRIL AND BIBRON, 1841, 'Erpét. Gén.,' VIII, p. 350 (type locality: Seychelles, Mauritius, and Bourbon). BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 52 (part: Barbary, Gambia, Zanzibar, and Seychelles; Angola: Bragança; Abyssinia: Sooroo Pass and Ain Samhar). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, pp. 275 and 670 (Senegambia and Tumbo Island). GÜNTHER, 1888, Proc. Zoöl. Soc. London, p 51 (Monbuttu, Belgian Congo). MOCQUARD, 1888, Mém. Cent. Soc. Philom., p. 133 (Somaliland). PFEFFER, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (Alexandria, Egypt; Korogwe, German East Africa). HÉRON-ROYER AND VAN BAMBEKE, 1889, Arch. Biol., IX, p. 252, Pl. XVI, figs. 1–3 (locality an error). MÜLLER, 1890, Verh. Naturf. Ges. Basel, VIII, p. 253 (Bolama, Portuguese Guinea). BOETTGER, 1892, 'Kat. Batr. Mus. Senck. Ges.,' p. 10 (Senegal, Abyssinia, and Dahalak Island). PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 90 (Zanzibar; Alexandria, Egypt; Korogwe, German East Africa). BOETTGER, 1893, Zool. Anz., XVI, p. 132 (Somaliland). STEJNEGER, 1893, Proc. U. S. Nat. Mus., XVI, p. 738 (Seychelles). GÜNTHER, 1894, Proc. Zoöl. Soc. London, p. 88 (Kribibi Basin, north of Lamu Island). BOCAGE, 1895, 'Herpétol. Angola,' p. 160 (Zanzibar and Mozambique). BOULENGER, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 16 (Somaliland: Auata and near Aberio); Proc. Zoöl. Soc. London, p. 539 (Tooroo, Somaliland). GÜNTHER, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 526 (Uganda and Shiré Highlands). ANDERSON, 1896, 'Herpetol. Arabia and Egypt,' p. 110 (localities of Anderson, 1898). BOCAGE, 1896, Jorn. Sci. Lisboa, (2) IV, pp. 80 and 96 (Mozambique and Portuguese Guinea: Bisao and Bolama). BOULENGER, 1896, Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 554 (Shoa, Abyssinia, and Saati, Eritrea); (2) XVII, pp. 14, 22 and 280 (Somaliland, Laffarug, Elba, Coromma, Lugh and Lake Abaia); Proc. Zoöl. Soc. London, p. 217 (Lake Rudolf and Dawa River). TORNIER, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 92 (Zanzibar and German East Africa: Usambara, Dar-es-Salaam, Korogwe, Yaquiro, Itoli, Victoria Nyanza, Pori Usiomi, Manjaro, Kwa Mumija and Bukoba). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 147 (Transvaal). BOULENGER, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland: N. W. Nyasa and Nyika Plateau). TORNIER, 1897, Arch. Naturg., LXIII, part 1, p. 65 (German East Afrika); ANDERSON, 1898, 'Zool. Egypt.,' I, p. 346, Pl. L, fig. 1 (Egypt: near Gizeh pyramids, Mahallet el Kabir and the Freshwater Canal, Suez). BOULENGER, 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 721 (Lugh, Somaliland). FERREIRA, 1898, Jorn. Sci. Lisboa, (2) V, p. 240 (Rio Cuce and Caconda, Angola). TORNIER, 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch Ost-Afrika,' p. 300 (German East Africa). BOULENGER, 1901, Ann. Mus. Congo, II, fasc. 1, p. 2 (Lake Moero). STEINDACHNER, 1901, Denkschr. Akad. Wiss. Wien (math.-natur.), LXIX, p. 335 (Suez and Sahiti). BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' p. 447 (Uganda). MOCQUARD, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 406 (British East Africa: Atchi River). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 62 (Cape St. John, Spanish Guinea). ANDERSSON, 1904, in Jägerskiöld, 'Results Swed. Zool. Exp. to Egypt and the White Nile,' 1901, I, fasc. 4, p. 9 (Egypt: Inchas, White River and White Nile). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107 (Northeast Benguella, Angola); Proc. Zoöl. Soc. London, II, p. 251 (Sibudeni, Zululand); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Portuguese Guinea: Bolama, Rio Cassini and Bissao, French Congo: Fernand-Vaz, N'Djolé, and Cape Lopez). ANDERSSON, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 229 (Bibundi, Cameroon). BOULENGER, 1907, Proc. Zoöl. Soc. London, II, p. 481 (Beira, Portuguese East Africa). WERNER, 1907, Sitzber. Akad. Wiss. 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Naturk., LIV, p. 210 (part: Mombassa and Kawirondo, British East Africa; possibly Cameroon). Boulenger, 1912, Ann. Mus. Stor. Nat. Genova, (3) V, p. 322 (Abyssinia: Wabi Mana, Hawash River). Nieden, 1912, 'Wiss. Ergeb. Deutsch Zentr. Afrika Exp.,' IV, p. 166 (Lake Region: Bukoba, Kifumbiro Ruanda, Lake Mohasi, Lake Kivu, Lake Mulera and northwestern edge of Lake Tanganyika). Peracca, 1912, Ann. Mus. Zool., Napoli, (2) III, No. 25, p. 7 (Northern Rhodesia). Werner, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 313 (Central and South Africa). Barbour, 1913, Proc. Biol. Soc. Washington, XXVI, p. 149 (Gizeh, Egypt). Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 356 and 362 (Lamu Island and Usambara). Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 168 (Eldorado and Marandellas, Southern Rhodesia). Klaptocz, 1913, Zool. Jahrb. (Syst.), XXXIV, p. 288 (French Guinea: Kouakry, Dubreka, Mamou and Koukoure). Pellegrin, 1914, Doc. Sci. Mis. Tilho, III, p. 128 (Northern Nigeria). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 351 (German East Africa, thirteen localities; British East Afrioa, five localities). Werner, 1915, in Michaelsen, 'Beiträge zur Kenntnis des Land und Süsswasser Fauna Deutsch-Südwestafrikas,' part 3, p. 372 (Okawanga, German Southwest Africa). Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 6 (Belgian Congo: Stanleyville, Bafwasende, Avakubi, Lesse, and Bosabangi). Werner, 1919, Denk. Akad. Wiss. Wien (math.-naturw.), XCVI, p. 453 (Senaar, Anglo-Egyptian, Sudan). Procter, 1921, Proc. Zoöl. Soc. London, p. 412 (British and German East Africa).

Rana esculenta Müller, 1885, Verh. Naturf. Ges. Basel, VII, p. 129 (Part: Egypt).

Rana marchii Rochebrune, 1885, Bull. Soc. Philom. Paris, (7) IX, p. 90 (Sangourougou, Senegal).

Rana mascareniensis var. *porossissima* Bocage, 1895, 'Herpétol. Angola,' p. 160 (Angola: St. Salvador du Congo, Duque de Bragança, Ambaca, Quibula, Caconda, Rio Quando and Huilla).

Rana subpunctata Bocage, 1895, 'Herpétol. Angola,' p. 161 (Duque de Bragança).

Rana mascariensis Johnston, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). (Misspelling for *R. mascareniensis.*) Meek, 1910, Publ. Field Mus., Zoöl., VII, p. 403 (British East Africa: Nairobi, Athi River and Lake Elmenteita).

Rana mascarensis Flower, 1900, Proc. Zoöl. Soc. London, p. 968 (Jebel Ain, White Nile). (Misspelling for *R. mascareniensis.*)

Rana ((*Ptychadena*) *mascareniensis* Boulenger, 1918, Bull. Soc. Zool. France, XLIII, p. 114; C. R. Acad. Sci. Paris, CLXV, p. 988. Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 451 (French Guinea and Liberia).

(For bibliography *ante* Boulenger 1882, refer to Anderson, 1898, p. 346.)

One hundred and thirty-eight specimens: twenty-six from Faradje in October 1912, four in January 1913, three in February, and one in April 1911; thirty-five probably from the same locality in October 1912; two from Stanleyville in February and thirty-six in April 1915; fourteen from the same locality in August 1909; five from Medje in March 1914; one from the same locality in July, two in August, and one in September

1910; two from Bafwasende, September 1909; two from Avakubi, October 1909; one from Garamba in May and one in June 1912; one from Niangara, November 1910; and one from Ngayu, December 1909. (A. M. N. H. Nos. 11122–11259.)

Distribution.—Hewitt (1911*b*, p. 222) has summed up the distribution of *R. mascareniensis* as "from Barbary and Egypt throughout Tropical Africa, southwards into Rhodesia (Gwamayaya River, Chubb). Mozambique, to Zululand (Mseleni and Sibudeni)." It is apparent that vegetation zones have little control over the range of *R. mascareniensis.* I am not at all sure that all the Cameroon records given above are referable to this species. *R. bibroni* appears to be much the commoner frog in that area and it has often been confused with *R. mascareniensis.* In other parts of the forest, such as the Upper Congo, *R. mascareniensis* is perhaps the dominant element of the amphibian fauna.

Relations.—I have examined typical specimens of both *R. mascareniensis* and *R. bibroni* from Cameroon. The latter species with its greatly prolonged snout and long legs is not to be confused with the former. Werner (1907) has proposed three new species of frogs closely related to *R. mascareniensis.* These, although reported from the Sudan, are not represented in our collections made in the Uele region. The specimens captured at Faradje are indistinguishable from specimens taken at Medje and Stanleyville.

Variations.—The well-preserved specimens in our series show an extraordinary constancy in the presence of the eight dorsal folds. But the color-variation is great and not correlated with either age or sex. The vertebral stripe, dorsolateral bands, and dorsal blotches exhibit great variation in specimens from a single locality. In life the specimens were equally variable. The series of twelve (Nos. 11209–11220) taken at Faradje on one occasion during October 1912 were described in the field as: "Dorsal surface generally pale brown, greenish or greenish brown; dorsolateral stripes yellowish, bright yellow in young specimens; vertebral stripe varying from brownish to yellowish in color, and of variable width, sometimes lacking; crossbands of legs broken into spots or absent; sides of the body a greenish gray; ventral surface whitish."

Habits.—These specimens described above were "found in meadows and plantations, also on the road at some distance from the swamps where they were most abundant."

Perhaps the majority of the specimens were collected in the vicinity of the marshes.

A pair taken August 9, 1909, in a swamp at Stanleyville, were found in embrace. Two specimens (Nos. 11155–11156) taken at the same locality, August 26, 1909, contained eggs in the cloaca and oviducts. It is apparent that the breeding season of *R. mascareniensis* at Stanleyville is at its height during the end of August. One specimen (No. 11242) taken at Faradje, October 1, 1912, has apparently just metamorphosed, for it is only 18 mm. in length. The breeding season at Faradje is probably not coincident with that at Stanleyville.

Thirty-nine stomachs which contained food were found to have the following assortment recognizable: 11 winged ants; 10 beetles; 5 winged termites; 7 spiders; 2 caterpillars, 2 grasshoppers; 2 snails (*Limicolaria*); 2 roaches, 2 bugs; 1 cricket, 1 isopod; 1 fossorial wasp (Sphegoidea); 1 reduviid and 1 dragon-fly. There was also present in these stomachs a great many fragments of insects.

Rana christyi Boulenger

Plate XXXV, Figure 1

Rana christyi Boulenger, 1919, Rev. Zool. Africaine, VII, p. 5 (type locality, Medje, Belgian Congo).

Thirty-six specimens: sixteen topotypes, five of these taken in April–May, one in July, and two in August 1910; eight taken in June 1914; sixteen specimens from Boyulu, September 1909; two from Faradje, October 1912; one from Garamba, May 1912; and one from Stanleyville, August 1915. (A. M. N. H. Nos. 10956–10991.)

Distribution.—*R. christyi*, if actually distinct from *R. æquiplicata*, represents at best only an eastern race of that species. Still, I do not care to use trinomials until the status of the two species is better understood. Our specimens were taken both in the Ituri forest and the Uele plains. *R. æquiplicata* has been recorded from only the Cameroon-Gaboon area, except for Boulenger's (1919) record of it from Medje and Mocquard's (1906) very probably erroneous record of it from Transvaal.

Relations.—Boulenger (1919) records both *R. christyi* and *E. æquiplicata* from Medje. The majority of our specimens agree with Boulenger's description of *R. christyi*, but a number of them approach so nearly the original description of *R. æquiplicata* that it seems very probable that Boulenger had similar specimens before him when he recorded *R. æquiplicata* from Medje. The differences which Boulenger (1919) points out for distinguishing *R. christyi* from *R. æquiplicata* disappear in our large series. Many of our specimens have small longitudinal folds between the pronounced dorsolateral folds. There is also much variation in head form. I have examined a typical specimen (M. C. Z. 2652) of *R. æquiplicata* in the Museum of Comparative Zoölogy from Efulen, Kribi, Cameroon. It differs from our specimens of *R. christyi* in lacking the pronounced dorsolateral folds, in having the vomerine teeth restricted to the inner edge of the choanæ (e.g. not projecting over their anterior end) and in having the webbing of the toes more extensive, especially noticeable on the fourth toe where it extends beyond the proximal joint of the penultimate phalanges (not falling just short of that joint as in our specimens of *R. christyi*). In view of the well-known variation in *R. oxyrhynchus* and *R. mascareniensis*, the closest relatives of the species under discussion, I am not at all convinced that *R. christyi* deserves recognition as a distinct species.

VARIATION.—Although short dorsal folds similar to those of *R. æquiplicata* may be present in this species, they are never as pronounced as the dorsolateral folds. In a few specimens of our series there is a Λ-shaped fold on the scapular region. Ovate tubercles forming short folds on the sides of the body are present in most of the specimens.

The variation in coloration is chiefly due to a change of the ground color from a pale yellowish gray to a dark reddish brown. The majority of the specimens are grayish with a tinge of yellow or pink. A black interorbital bar, a Λ on the scapular region and a series of spots on the sides and posterior regions are present on the most highly colored specimens. Dark cross-bars are nearly always present on the upper surfaces of the legs but the spotting on the posterior faces of the thighs exhibits great irregularity and is sometimes entirely absent.

In life, the specimens captured at Boyulu were either "light gray, nearly white above, with no spotting, except on the sides; or greenish to dark brown with a series of black spots between the pronounced dorsolateral folds."

HABITS.—These specimens described above were found "in temporary pools formed in the road through the forest. When approached the frogs would leap rapidly into the nearby grass and would hide under leaves or moss to escape detection. It was apparently the height of the breeding season for large masses of spawn were found in these pools. The chorus was very persistent, each performer uttering two sharp notes in rapid succession."

These breeding frogs were taken at Boyulu, September 19, 1909. An examination of the sexual organs of specimens from this and other localities allows me to infer that oviposition may take place at Medje during May and August. A specimen (No. 10988) taken in May 1912, at Garamba, has its ovaries greatly distended with large ova. It seems very probable that the breeding season is irregular and not coincident in different localities.

Six stomachs contained food. This included 4 grasshoppers (*Tettigonia*, etc.); 1 snail (*Helixarion*); 1 caterpillar; 1 cricket; 1 beetle; 1 soldier termite; 1 winged ant; and 1 spider,

Morphological Note.—I have remarked elsewhere (Noble, 1920) that the terminal phalanges of *R. christyi* normally pierce the skin as commonly as do those of *R. mascareniensis*. Boulenger (1917*b*) has discussed this problem in some detail and I may only add that in *R. christyi* there is present a dense capsule of connective tissue through which the exposed terminal phalanges may slip (Pl. XXVI, fig. 2). The number of exposed terminal phalanges is subject to considerable variation, but in general the inner digits exhibit this anomalous condition of the phalanges more commonly than do the outer ones.

Rana oxyrhynchus A. Smith

Plate XXXV, Figure 2

Rana oxyrhynchus A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. lxxvii, fig. 2 (type locality: Kafirland and region of Port Natal). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 51 (Angola: Bragança and Caragigo; Cape of Good Hope and and Natal). Peters, 1882, 'Reise nach Mossambique,' III, 147 (Zanzibar and Mozambique: Boror, Quilimane, and Cabaçeira). Boulenger, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland: northwest Nyasa and Nyika Plateau). Sclater, 1899, Ann. S. African Mus., I p. 107 (South Africa). Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero). Peracca, 1904, Boll. Mus. Torino, XIX, No. 467, p. 4 (Eritrea). Boulenger, 1905, Ann. Mus. Nat. Hist., (7) XVI, p. 108 (Angola: Duque de Bragança and Quanza River); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 160 (Bissao, Portuguese Guinea); 1907, Proc. Zoöl. Soc. London, II, p. 481 (Zoutspansberg, Transvaal; and Coguno and Beira, Portuguese East Africa); 1908, Ann. Natal Mus., I, p. 222 (Natal and Zululand; Kasi Bay); 1909, Trans. Zoöl. Soc. London, XIX, p. 240 (Ruwenzori); 1910, Ann. S. African Mus., V, p. 527 (Rhodesia: Salisbury and Livingstone). Roux, 1910, Rev. Suisse Zool., XVIII, p. 101 (Busoga, Uganda). Andersson, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 28 (British East Africa: Lekiundo and vicinity of Blue Post). Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Bussu and Kakindu, Uganda). Hewitt, 1911, Rec. Albany Mus., II, p. 221 (partial summary of above localities. In addition: Waterval Onder, Transvaal; Marandellas, Rhodesia). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 210 (Tuwa River, German East Africa, and Mowange, Cameroon). Boulenger, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria). Hewitt, 1912, Rec. Albany Mus., II, p. 281 (Marianhill, Natal). Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, pp. 346, 348, 356, and 357 (Zanzibar, Pemba, and Lamu Islands; Mikindani, German East Africa). Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 168 (Marandellas, Rhodesia). Nieden, 1914, Sitzber. Ges. Naturf. Freunde Berlin, p. 367 (German East Africa). Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Agouagon, Dahomey; Sédhiou, French West Africa). Procter, 1921, Proc. Zoöl. Soc. London, p. 412 (Kagiado, German East Africa).

Rana oxyrhyncha Müller, 1885, Verh. Naturf. Ges. Basel, VII, p. 130 (South Africa). Pfeffer, 1888, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (German East Africa: Kikoko); 1892, X, part 1, p. 90 (German East Africa: Korogwe and Kikoko). Matschie, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togo). Bocage, 1895, 'Herpétol. Angola,' p. 159 (Angola: Duque de Bragança, Pungo-Andongo, Benguella, Quissange, Quindumbo, Cohota, Caconda, and Rio Quando); 1896, Jorn. Sci. Lisboa, (2) IV, pp. 80, 101, and 210 (Portuguese Guinea: Bolama; Mozambique; Quilimane and Boror; and Angola: Hanha). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 91 (Zanzibar and German East Africa: Undussuma, Kakoma, Korogwe, and Kikoko); 1897, Arch. Naturg., LXIII, part 1, p. 65 (German East Africa); 1898, in Werther, 'Die mittleren Hochländer des nördlichen Deutsch-Ost-Afrika,' p. 300 (German East Africa). Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 406 (British East Africa: Atchi River). Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 160 (Luinha River, Angola). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 495 (Ossidinge, Cameroon). Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 22 (Kilimanjaro). Nieden, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 38, figs. 52 and 53; Arch. Naturg., LXXVI, part 1, p. 241 (Garua District, Cameroon); Sitzber. Naturf. Freunde Berlin, p. 444 (Amani, German East Africa); 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 166 (Kifumbiro, Mporo, and near Beni); 1915, Mitt. Zool. Mus. Berlin, VII, p. 349 (German East Africa, twenty localities; Portuguese East Africa, three localities; British East Africa, six localities).

Rana oxyrhynehus Werner, 1896, Jahrb. Ver. Magdeburg, p. 147 (Transvaal). (Misspelling for *R. oxyrhynchus.*)

Rana (*Ptychadena*) *oxyrhynchus* Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 451 (French Guinea; several localities).

Thirty-four specimens: ten from Medje in April–May and one in July 1910; three from the same locality in April and two in June 1914; two from Faradje in February, seven in March, and one in April 1911; two from the same locality in December 1912 and one in September 1911–June 1912; two from Niapu, January 1914; one from Garamba in May and one in June 1912; one from Gamangui, February 1910. (A. M. N. H. Nos. 11088–11121.)

Distribution.—*R. oxyrhynchus* is widely distributed over Africa south of the Sudan. It is unknown from the Abyssinian-Somaliland area except for a single record by Peracca (1904) of its occurrence in Eritrea. It is replaced in the Sudan proper by several related species. Our specimens from Garamba and Faradje are indistinguishable from those from the Rain Forest. The range of *R. oxyrhynchus* is about as extensive as that of *R. mascareniensis*. In the case of both species vegetation zones seem to have little effect upon the distribution.

Relations.—*R. oxyrhynchus* is distinguished from the other species of *Rana* by a combination of the following characters: six or more longitudinal folds on the back (rarely broken); tibio-tarsal articulation extending considerably beyond the snout; toes webbed to the tips of the third and fifth toes, the tips not dilated; a single metatarsal tubercle present. *R. oxyrhynchus* with its very extensive webbing is not to be confused with *R. mascareniensis* with which it is often associated.

Variation.—The majority of our specimens are identical with two specimens (Nos. 3191 and 5199) of *R. oxyrhynchus* from Natal. In a few, however, the dorsal folds are partially discontinuous. The series of specimens (Nos. 11088–11097) from Medje, April–May 1910, exhibits all stages from a field of irregular folds scarcely definable as rows to the more frequent arrangement of eight complete folds extending the length of the back. It is evident that a series of complete folds is not a constant feature of the species.

The variation in color is chiefly due to a multiplication of the black spots of the back. The ground tone is generally reddish or greenish brown. A broad vertebral stripe of pale brown is present in some of the specimens. The specimens have changed but little in preservation. The field description for one specimen (No. 11104) from Gamangui, taken February 14, 1910, may be considered characteristic for the species: "Dark gray above, tinged with brown; a dark bar between the eyes; many irregular dark markings on the body and hind limbs; throat and abdomen yellowish, a few dark markings on the lips and across the chest; upper half of iris yellowish, lower half a dark brown."

Habits.—*R. oxyrhynchus* was found to be "abundant in the swamps, along the brooks, and near the shores of rivers." Specimens taken at Medje in April and May 1910 were found in the forest where "they were observed to hop rapidly over the ground and take shelter among the fallen leaves. There they were discovered with difficulty for their colors blended well with the decaying leaves. They croaked very loudly during the evening and at night in puddles near a village."

Females exhibiting the maximum development of the ovaries were taken at Medje during April, May, and July. It seems probable that they were breeding during this period.

Only fourteen stomachs of those examined contained food. The larger part of this was too fragmentary for identification. The following was the total amount of material distinguishable: 4 grasshoppers; 2 snails (*Helixarion*); 1 beetle; 1 spider; and 1 cricket.

Rana ornatissima Bocage

Plate XXXIII, Figure 2

Rana ornatissima Bocage, 1879, Jorn. Sci. Lisboa, (1) VII, pp. 89 and 98 (type locality: Bihé, Angola); 1895, 'Herpétol. Angola,' p. 157, Pl. xvi, fig. 2 (high plateaux of Angola: Bihé and Galanga); 1987, Jorn. Sci. Lisboa, (2) IV, p. 202 (same localities). Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107 (Bingondo in northern Bihé, Angola).

Hildebrandtia ornatissima Nieden, 1907, Sitzber. Ges. Naturf. Freunde, p. 228.

Rana ruddi (?) Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 168 (Eldorado, Southern Rhodesia). (Not of Boulenger, 1907.)

Rana (Hildebrandtia) ornatissima Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, p. 34 (Southern Rhodesia and Mossamedes, Angola).

Twenty specimens from Garamba: fourteen taken in May, five in June and one in July 1912. (A. M. N. H. Nos. 10879–10898.)

Distribution.—Boulenger (1919*d*) gives the range of *R. ornatissima* as extending from Angola to Southern Rhodesia. Our specimens were taken far north of this region.

Relations.—It was only with considerable hesitation that I have referred our specimens to *R. ornatissima*. Our specimens are certainly nearer to that species as defined by Boulenger (1919*d*) than to any other. Perhaps the most distinctive character of our specimens is their short webs. Two phalanges of the third toe are free. Nevertheless, all the specimens have the dorsolateral folds very obscure. In some specimens there is no indication at all of such folds. The tympanum is at least three-fourths the size of the eye, and in the majority of the specimens it equals it in diameter. Apparently our specimens exhibit some of the distinguishing features of *R. macrotympanum* and *R. ornata*, but I can find no constant character in our series with which to separate our specimens from *R. ornatissima*. The explanation of this condition probably lies in the fact that *R. ornatissima* is at best a subspecies of *R. ornata* and that *R. macrotympanum*, known only from Gallaland, is synonymous with *R. ornata*. Boulenger (1905*a*) formerly indicated that *R. budgetti* was "merely a color variety" of *R. ornatissima*. *R. togoensis* probably falls in the same category. It seems to me that the only recognizable species of the section *Hildebrandtia* are *R. ruddi*, *R. moeruensis* and *R. ornata*. Our material, coming from only a single locality, exhibits so much variability that it practically confirms this opinion. Still, I do not care to unite *R. ornatissima* with *R. ornata* until I have examined typical material from East Africa.

Variation.—Aside from the variability in size of the tympanum and roughness of the back, our series shows little uniformity in the length of the hind limb. The tibiotarsal articulation reaches either the tympanum or the eye. In ten specimens of various sizes taken at Garamba in May, the tibia into the head and body length averaged 2.3 times (maximum. 2.5; minimum, 2.2). None of these ten specimens were sexually mature, the largest being a female 64 mm. from snout to vent.

The color-pattern shows great uniformity throughout our series. Its variation is limited to a breaking up of the two dorsal stripes into segments and to a confluence or a restriction of the spots on the sides of the back and body.

Habits.—In the fifteen stomachs which contained food, four young toads were found. These toads were not small. One specimen of *R. ornatissima*, a female 57 mm. in length, taken in May 1912, contained a badly crushed specimen of *Bufo regularis* 31 mm. in length, or 54 per cent of the length of the *R. ornatissima*. Another specimen of *R. ornatissima*, taken the same time as the other, but measuring only 42 mm. in length, had swallowed an unidentifiable toad 24 mm. in length. A third specimen of *R. ornatissima*, taken in June and measuring 57 mm. from snout to vent, contained in its stomach two whole specimens of *B. regularis*, each 22 mm. in length. It is apparent that young toads form a large part of the diet of *R. ornatissima*.

The remainder of the food consisted of 6 ants; 6 crickets; 5 beetles; 4 bugs; 4 grasshoppers; 3 snails; 3 caterpillars; 2 myriopods; 2 lumbricids; 2 spiders; 2 larvæ (beetle ?); 1 termite; and some extraneous matter, including flowers.

CHIROMANTIS Peters

The distribution of the species of *Chiromantis* illustrates very well the distinctness of the forest and open country faunas. *C. rufescens* is apparently confined to the forest (see below), while the other four recognizable species of the genus have more or less extensive ranges in the open country from Abyssinia to northern South Africa.

The five species of *Chiromantis* may be distinguished as follows:

a_1.—Outer finger webbed to one-third or less its length.
  b_1.—Disks of digits small.
    c_1.—Loreal region concave, interorbital space less than upper eyelid. *C. kachowskii.*
    c_2.—Loreal region not concave, interorbital space equal to or broader than upper eyelid.......................................*C. petersii.*
  b_2.—Disks of digits very large.............................*C. kelleri.*

*a*₂.—Outer finger webbed more than one-third its length.
  *b*₁.—Outer finger one-half to two-thirds webbed . . . . *C. xerampelina.*
  *b*₂.—Outer finger three-fourths to completely webbed . . . . *C. rufescens.*

Chiromantis rufescens (Gunther)

Plate XXXVI

Polypedates rufescens Günther, 1868, Proc. Zoöl. Soc. London, p. 486 (type locality: West Africa).

Chiromantis rufescens Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 92, Pl. x, fig. 2 (West Africa). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 96 (Usambara, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p. 65 (German East Africa). Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 193 (Cameroon). Mocquard, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219 (Plains of the Zambezi). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 445 (Cameroon and Gaboon). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 10 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernando Po). Mocquard, 1908, in Foà, 'Résultats Scientifiques des Voyages en Afrique d'Edouard Foà,' p. 558 (Plains of the Zambezi). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 500 (Cameroon: Victoria, Buea, Bipindi, Jaunde, Johann-Albrechtshöhe, and Ebolowa). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Mundamé, Cameroon). Nieden, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 52, figs. 102–104 (localities of Nieden, 1908). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 132 (Efulen, Cameroon). Despax, 1911, in Cottes, 'La Mission Cottes au Sud-Cameroun,' p. 241 (Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 212 (Cameroon: Bibundi, Isongo, and Mowange). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 363 (Part: Usambara, German East Africa). Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 9 (Medje, Belgian Congo).

Thirty-six specimens, all from Medje: two in June and two in August 1910; one in February, three in April, two in May and twenty-six in June 1914. (A. M. N. H. Nos. 9364–9399.)

Distribution.—It is apparent from the literature given above that *C. rufescens* is primarily a Rain Forest form. Its occurrence in the forest outlyer of Usambara was to be expected but it seems highly probable that Mocquard's records of *R. rufescens* in the Zambezi region should be referred to *C. xerampelina*. These two species are very much alike but I cannot agree with Nieden (1915) that they are identical. If they should be proved identical, then *C. rufescens* would have an extraordinary range throughout the Rain Forest of western Africa and the arid plains of the southeastern provinces.

Relations.—Nieden (1915) has discussed the status of the two species in considerable detail, and I can add only that the small series before me does not bear out his opinion that the two species are identical. Our specimens of *C. rufescens* from Medje are identical with a large series in the Museum of Comparative Zoölogy from Cameroon. All the well-preserved specimens in both series differ from two beautiful specimens (A. M. N. H. Nos. 3133 and 3187) of *C. xerampelina* from Mokowe, Zululand, in having a more extensive webbing between the digits and in being some tone of reddish brown instead of ashy gray. One of these specimens (No. 3187) is a sexually mature male, 63 mm. from snout to vent, distinctly larger than any of the males of *C. rufescens* in our series (maximum, 57 mm.; minimum, 54 mm.; average, 56.1 mm. for ten breeding males). I agree with Nieden that head-form has very little importance in distinguishing the two species but, if well-preserved specimens are compared, a difference is very apparent in the extent of the webbing along the outer fingers. Several of the specimens of *C. rufescens* are very pale but they are tinged with yellow and are not ashy as both of our specimens of *C. xerampelina*.

Variation.—The ground color of our series varies from a pale yellow to a dark reddish brown. The narrow interorbital band of dark brown and the broader bands of the same color across the shoulder and sacral regions are more or less connected by a delicate network of reddish brown. The photograph (Plate XXXVI, fig. 1) shows well the pattern characteristic of our specimens.

The colors have changed but little in alcohol. The yellows and reddish browns were sharply contrasted in life. Very conspicuous was the iris, which was pale yellow finely veined with dark brown and bearing a dark spot just before and another just behind the pupil.

Most of the breeding males in our series are shagreened above with small spines. While none of the females possess these spines, some of the breeding males, taken at the same locality as the others, lack them entirely. It is apparent that these spines are not a constant secondary sexual character.

There is a marked difference between the sexes in size, the females being conspicuously larger. The largest female (No. 9384) in our series is 71 mm. from snout to vent. The average of ten breeding females is 67.2 mm. (maximum, 71 mm., minimum, 64 mm.). It is apparent that even the smallest sexually mature female is larger than the largest male.

Habits.—The many writers who have commented on the peculiar habits of *Chiromantis rufescens* have considered the species arboreal. This term would ordinarily convey the idea that the species is tree-dwelling in the sense of the South American Hylas. It was therefore of interest to learn that Messrs. Lang and Chapin found the frog never high in the trees and generally on low bushes or in ponds near streams.

Observations made by them confirm the well-known account of the breeding habits of *C. rufescens* as given by Peters (1876). Egg "nests" were taken at Medje on May 28, June 17, and June 24, 1914. These were found on the stems and leaves of trees, often at a distance from water. On one occasion one "nest" was found on one side and another on the other side of a single large leaf. Only one of the several nests discovered was found attached to the trunk of a tree low to the ground. All of the "nests" were found within five or six feet of the ground, and some of them were very disorderly, the gelatinous foam smeared over several leaves, and the egg cluster fully exposed to the light.

It has been generally assumed after the observation made on related species of frogs (especially noteworthy: Siedecki, 1908 and 1909) that the foam "nests" of *C. rufescens* were formed by beating of the hind limbs of the copulating frogs. Mr. Lang was able to confirm this opinion in observing a female beating a froth even in the absence of the male. I quote directly from the field notes: "We received an especially large female and I put it alive in a little box where it would be safe from the ants. A short time later on opening the lid of the box I was amazed to find it sitting on a patch of frothy matter (60 mm. in diameter and 45 mm. high) which looked exactly like the beaten white of egg. It was apparent that the frog had been working the mass with its legs for they were covered with the gelatinous substance. This substance could be squeezed by pressure from the anus of the frog. It was colorless, jelly-like and when rubbed between the fingers became foamy like the matter under the frog. Later the frog was observed to move its legs slowly backward and forward in beating more air into the foamy mass."

Unfortunately, none of the egg-masses were preserved. Eggs taken from the cloaca of a female (No. 9398) are unpigmented and average 2.5 mm. in diameter. This specimen was taken as late as July 5, 1914. It is therefore apparent that the breeding season of *C. rufescens* is extended through at least the month of June. The majority of our females taken during that month show post-oviposition conditions of their ovaries, but a few still possess eggs in the ovarium.

Of eleven stomachs which contained food, only the following variety was identifiable: 2 beetles, 1 caterpillar; 1 heteropterous insect (pentatomid); 1 wasp (*Odynerus*) and 1 leaf-hopper.

Kassina Girard

This genus of characteristically savannah frogs embraces but two species. These two species are readily distinguishable from each other.

a_1.—Toes one-third webbed. Brownish above with a darker tone; a light inguinal area . . . . *K. obscura.*

a_2.—Toes with a slight rudiment of a web, often indistinct. Greenish above, more or less striped on the back; no inguinal spot . . . . *K. senegalensis.*

Kassina senegalensis (Duméril and Bibron)

Cystignathus senegalensis Dumréil and Bibron, 1841, 'Erpét. Gén., VIII, p. 418 (type locality: Lakes in the vicinity of Galam, Senegal).

Cassina senegalensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 131 (Cape of Good Hope and the Zambezi). Günther, 1893, Proc. Zoöl. Soc. London, p. 618 (Nyasaland). Boulenger, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 17 (Auata, Somaliland). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 157 (German East Africa: Mossai-Niyka and Dar-es-Salaam). Johnston, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). Tornier, 1897 Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). Anderson, 1898, Zool. Egypt, I, p. 348 (Egypt: Sennar District). Sclater, 1899, Ann. S. African Mus., I, p. 108 (South Africa). Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero); 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 409 (British East Africa: Atchi River). Schenkel, 1902, Verh. Naturf. Ges. Basel, XIII, p. 150 (Natal). Boulenger, 1907, Proc. Zoöl. Soc. London, II, p. 482 (Illovo, Natal). Werner, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1905 (Sennar, Egypt). Chubb, 1908, Ann. Mag. Nat. Hist., (8) II, p. 220 (Matabeleland: Kana, Shangani, and Bubi Rivers). Odhner, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 7 (Northern Zululand: Sibayi-Lake). Chubb, 1909, Proc. Zoöl. Soc. London, II, p. 592 (Matabeleland: Kana River). Boulenger, 1910, Ann. S. African Mus., V, p. 532 ("Tropical Africa," Cape Colony, Natal, and Southern Rhodesia). Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 25 (Kilimanjaro). Meek, 1910, Publ. Field Mus., Zoöl., VII, p. 404 (British East Africa: Nairobi and Athi Plains). Andersson, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 32 (British East Africa: Nairobi and Pundamelia). Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169 (Uganda: Mbola). Hewitt, 1911, Ann. Transvaal Mus., III, part 1, p. 13 (Cape Colony); Rec. Albany Mus., II, p. 224 (Résumé of distribution with additional South African localities); 1912, II, p. 280 (Kaaimans River, Cape Colony). Nieden, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 181 (Ruanda, Lake Region). Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Cape Colony: Kimberley, Kaaimans River, Bechuanaland: Madibi). Nieden, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 452 (German Southwest Africa: Windhuk and Klein Nauas); 1915, Mitt. Zool. Mus. Berlin, VII, p. 370 (partial résumé with additional localities. British East Africa: Kibwezi. German East Africa: Ukerewe Island, Tanga, and Kilwa). Procter, 1920, Proc. Zoöl. Soc. London, p. 419 (Nairobi, British East Africa and German East Africa). Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 459 (Dixine, French Guinea).

Cassina wealii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 131 Pl. x, fig. 7 (Kaffraria). Sclater, 1899, Ann. S. African Mus., I, p. 108 (South Africa).

BOULENGER, 1910, Ann. S. African Mus., V, p. 532 (Cape Colony and Natal). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 460 (Beyla and N'Zébéla, French Guinea; Sanikolé, Liberia).

Cassina argyreivittis PETERS, 1882, 'Reise nach Mossambique,' III, p. 157, Pl. XXII, fig. 2; Pl. XXVI, fig. 3 (Portuguese East Africa: Boror and Cabaçeira). FISCHER, 1884, Jahrb. Hamburg. Wiss. Anst., part 1, p. 27 (Naivasha Lake).

Cassina senegalensis var. *intermedia* WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Cape Colony).

Forty-five specimens: thirty-eight from Niangara, June 1913; two from Bafwasende, September 23, 1909; two from Garamba, May 1912; two from Faradje, November 1912; and one from Rungu, January 28, 1913. (A. M. N. H. Nos. 9318–9355.)

DISTRIBUTION.—The range of *K. senegalensis* is very extensive, embracing all of the open country of Africa south of the Sahara excepting certain parts of Angola, Southwest Africa, and other little-explored regions. Our two specimens from Bafwasende represent the first record of the species from the Rain Forest proper. It seems almost certain that the occurrence of the species in that region is of an accidental nature for the species is a well-known inhabitant of the plains.

RELATIONS.—Boulenger (1907*e* and 1910*a*), Andersson (1911) and Hewitt (1911*b*) have already pointed out that *K. wealii* is probably identical with *K. senegalensis*. Our series of specimens exhibits considerable variation in the distinctness of the rudimentary web. I can find no distinguishing character of *K. wealii* which is not present in our series of *K. senegalensis* and I have not hesitated in uniting these two species.

VARIATION.—Andersson (1911) has discussed the variation in limb proportions of this species and Nieden (1915) the variation in color. *K. senegalensis* is such a well-marked species that no further discussion is necessary for purposes of identification.

I have compared a specimen (A. M. N. H. No. 5198) of *K. senegalensis* from Cape Colony with our large series from Niangara and can find no differences of any kind. This is another illustration of uniformity in the wide-ranging forms.

HABITS.—Most of the females taken at Niangara in June have their bodies greatly extended with ova. These ova are slightly less than a millimeter in diameter and are densely pigmented at one pole. It is probable that the breeding season occurs in June or July.

Very little is known about the habits of *Kassina senegalensis*. Chubb (1908) has remarked: "This frog makes a peculiar shrill noise; it occasionally ascends trees and was pointed out to me as a tree frog." Hewitt and Power (1913) have said: "It is a running frog and does not jump. Near Grahamstown, at midsummer, we have taken it in abandoned ant-hills near a vlei far remote from bush, but in general it seems to favor bush or forest districts and is said to climb trees. Andrew Smith took his specimens in burrows in the ground."

In the stomachs of nineteen of our specimens the following assortment of food was found: over 200 worker and soldier termites; 7 worker ants; 1 cricket; 1 grasshopper; 1 beetle; and 4 larvæ (beetle ?).

LEPTOPELIS Günther

It has been pointed out above that this genus possesses a very different pectoral girdle than *Hylambates*, the genus with which it has hitherto been confused. Only the following eight species can at this time be included in the genus, but dissection will reveal that many of the species grouped under *Hylambates* are actually referable to *Leptopelis.*

- a_1.—Fingers free .... *L. anchietæ.*
- a_2.—Fingers more or less webbed.
  - b_1.—Fingers less than one-third webbed.
    - c_1.—Metatarsal tubercle oval, not compressed .... *L. notatus.*
    - c_2.—Metatarsal tubercle prominent, compressed.
      - d_1.—Third and fifth toes completely webbed .... *L. tessmanni.*
      - d_2.—Third and fifth toes two-thirds webbed .... *L. aubryi.*
  - b_2.—Fingers at least one-third webbed.
    - c_1.—Head greatly widened behind eyes, nearly full breadth of tympanum seen from above .... *L. brevirostris.*
    - c_2.—Head not distinctly widened behind eyes; tympanum lateral.
      - d_1.—Fingers two-thirds webbed, web extending to terminal phalanx of outer finger, not quite to this point on third finger. *L. palmatus.*
      - d_2.—Fingers not more than half webbed, but web sometimes continued as seam to terminal phalanx of outer finger.
        - e_1.—A conical tubercle on heel, two or three tubercles forming a seam on forearm near elbow .... *L. calcaratus.*
        - e_2.—No tubercle on heel or forearm .... *L. rufus.*

Leptopelis anchietæ (Bocage)

Plate XXXI, Figure 4; XXXVIII, Figure 2

Hylambates anchietæ Bocage, 1873, Jorn. Sci. Lisboa, IV, p. 226 (type locality: interior of Mossamedes). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 133 (same as above); 1890, Proc. Zoöl. Soc. London, p. 324 (Angola). Bocage, 1895, 'Herpétol. Angola,' p. 177, Pl. xix, figs. 4 and 4*a* ("hauts plateaux de l'intérieur" of Angola: Huilla, Caconda and Quindumbo); 1897, Jorn. Sci. Lisboa, (2) IV, p. 205 (Angola: Huilla). Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 110 (N. E. Benguella, Angola). Nieden, 1910, Arch. Naturg., LXXVI, part 1, p. 243 (Cameroon: Bamenda); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 54, figs. 54 and 55 (same locality).

Ten adults: six from Faradje, October 1912 and January 1913 and one from each of the following localities: Niangara, November 1910; Yakuluku, November 1911; Vankerckhovenville, April 1912; and Garamba, June 1912. (A. M. N. H. Nos. 8668–8677.)

Distribution.—Prior to 1910, *Leptopelis anchietæ* was known only from Angola. Tornier's record (1896, p. 66) of its occurrence in Tanganyika Territory was shown by Nieden (1915, p. 368) to be an error. In 1910 Nieden recorded the species from Bamenda, a high savannah area north of the Cameroon forests. Nieden's record, supported by the fact that the American Museum expedition found the species only in the savannah areas north of the Ituri, suggests the probability that the species may be a typical savannah form with a more or less continuous range throughout the savannahs skirting the Rain Forest.

I have recently examined a specimen (M. C. Z. 3484) taken from the stomach of a snake captured near the Guaso Nyiro River, Kenya Colony. This specimen differs from our specimens of *L. anchietæ* in having slightly smaller digital expansions. Further, the Ω-shaped mark on the back is darker and broader than in any of the specimens of *L. anchietæ* before me. No other differences are apparent to distinguish this East African specimen from our series from the Sudan. For the present, we must conclude that *L. anchietæ* occurs not only in the savannahs north and south of the Rain Forest but also in Kenya Colony.

Relations.—Boulenger (1906, p. 166) has considerably reduced the number of species related to *H. bocagii*, but in his synopsis (idem, p. 170) of the genus *Hylambates* he has distinguished *anchietæ* from that species by its less-developed metatarsal tubercle. Judging only from the descriptions, and Bocage's figures (1895), I would be inclined to reduce *anchietæ*, also, to synonymy. Our series of ten specimens show so much variation that little weight can be placed on the degree of development of the "shovel." Still, an examination of a series of specimens from Angola may show that *anchietæ* possesses a distinctive coloration or some other constant difference. If not identical, *anchietæ* is very closely related to *bocagii*.

Variation.—The "shovel" varies from a little more than one-half the length of the inner toe, to nearly the length of it. This range covers the differences given by Boulenger (1906) for distinguishing the species from *bocagii*. It is to be noted that the metatarsal tubercle as indicated by Bocage (1895, Pl. xvii, fig. 1) is distinctly longer than the inner toe.

Seven of the ten specimens have a well-marked pattern on their dorsal surface. This pattern consists of three dark longitudinal stripes which flow broadly together just behind the head. The ground tone in alcohol is either brown or gray. There is an additional broad stripe on each side. In the smallest specimens this stripe is edged above with a white line. A similar white line occurs above the anus and along the legs as shown in the photograph (Plate XXXVIII, fig. 2). The specimens have faded little in alcohol, for no greens were present. One specimen (No. 9676), a sexually immature female, taken at Faradje, in February, was observed in the field to be: "light brown above, with three nearly black lines extending the length of the back. A broad stripe of dark brown was present on the sides of the head and body. The lower margin of this stripe was stippled with a white or bluish tone. The tip of the snout and the lips were lighter than the rest of the head. The iris was dark brown of bronzy lustre."

Our specimens vary in size from 33 mm. to 51 mm., from snout to vent. There is apparently no sexual dimorphism other than size. No breeding pairs were taken and the degree of this difference is not exactly known.

HABITS.—One female (No. 8670), taken at Garamba in June 1912, has the ovaries greatly distended with large ova. Since none of the other five females taken during other months approach this condition, it is probable that the breeding season occurs in June or July.

The stomachs of only six individuals contained food. Only the following was distinguishable: 4 grasshoppers, 2 beetles, and 1 cricket.

Leptopelis notatus (Buchholz and Peters)

Hylambates notatus BUCHHOLZ AND PETERS, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 205, Pl. II, fig. 1 (type locality: Cameroon). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 505 (Cameroon: Bipindi and Jaunde); 1909, Arch. Naturg., LXXV, part 1, p. 365 (Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 55, fig. 111 (Cameroon: Victoria, Bipindi, and Jaunde).

Hylambates rufus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 136 (part: West Africa). (Not of Reichenow.)

Hylambates cubitoalbus BOULENGER, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 323 (Zima, South Cameroon and Unyoro, Lake Albert Region); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 171. BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Kribi, Cameroon).

Hylambates aubryi ANDERSSON, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 168 (part: Cameroon). (Not of A. Duméril.)

A single immature female taken at Medje in July 1914. (A. M. N. H. No. 8874.)

DISTRIBUTION.—This little-known species is apparently confined to the rain forests. I have recently examined in the Museum of Comparative Zoölogy at Harvard a fine series (M. C. Z. 3446–3448) from Lolodorf, Cameroon).

Relations.—This series convinces me that *L. notatus* must be a distinct species in spite of Andersson's statement to the contrary. Our specimen is nearly uniform grayish-brown (70) above and possesses the characteristic white spots on the elbow, knee, and heel. Nieden (1909) has claimed these white marks to be diagnostic of the species. Certainly none of the immature specimens of *L. aubryi* or *L. rufus* in our series show any condition approaching that found in the specimen under consideration. Our specimen is only 27 mm. in length (head and body). Nothing is known of its habits.

Leptopelis calcaratus (Boulenger)

Plate XXXI, Figure 3

Hylambates calcaratus Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322 (type localities: Efulen, Cameroon; Spanish Guinea: Cape St. John and the Benito River District); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 169 (Buea, Cameroon). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 506 Makomo, Spanish Guinea). Barbour, 1911, Bull. Mus. Comp, Zoöl., Cambridge, LIV, No. 2, p. 135 (five miles inland from Kribi, Cameroon).

Hylambates rufus Nieden, 1909, Arch. Naturg., LXXV, part 1, p. 364 (West Africa). (Not of Reichenow.)

Thirty-five specimens: three from Niapu, January 1914; the rest from Medje, taken as follows: during 1910, three in April, one in June and two in July; during 1914, two in April, one in May, sixteen in June and six in July. (A. M. N. H. Nos. 8676–8712.)

Distribution.—The range of *L. calcaratus* is apparently limited to the Rain Forest. The few references in the literature to this species do not include any record of its occurrence west of Cameroon. This is not surprising in view of the fact that the species has until recently been confused with *L. rufus*.

Relations.—Boulenger, in his original description of *L. calcaratus*, states: "this species stands very near *H. rufus*, Reichn., differing only in the rather less depressed head and in the presence of a conical tubercle on the heels." Nieden (1909), not finding these characters diagnostic, reduced *L. calcaratus* to synonymy. After a careful comparison of our large series with an equally large one of *L. rufus*, I cannot agree with Nieden for, while the characters given by Boulenger are somewhat variable, there are other differences which are constant:

L. calcaratus	*L. rufus*
Spur on the heel always more or less developed	Spur generally absent; an indication of a tubercle in some young specimens.
A denticulated ridge along the forearm.	A smooth seam often present on the forearm.
Fingers a trifle less than half webbed, no seam extending along the inside of the outer finger.	Fingers half webbed or more, a seam generally present on the inside of the outer finger.
End of the snout always of much lighter color than the rest of the head.	End of the snout (except sometimes the lip) of same color as the rest of the head.
Ventral coloration when distinct (faded in most females) consisting of a dark wash or marbling on the sides of the belly and across the chest; the central part of the belly white or slightly spotted.	Ventral coloration when distinct consisting of a coarse network of dark color extending uniformly across the entire ventral surface or restricted to the chest; never a sharply differentiated light area on the belly.
A sexually mature pair measuring ♂ 40 mm. ♀ 56.5 mm.	A sexually mature pair measuring ♂ 45 mm. ♀ 68 mm.
Maximum size ♀ 58 mm.	Maximum size ♀ 73 mm.

VARIATION.—Only one specimen (No. 8712) in our series lacks the spurs. This specimen has the denticulated seam along the forearm and the light snout. The absence of the spurs may be due to rubbing or some other injury after fixation.

Most of the specimens in the series are reddish brown above, with some indication of dark spotting; a few are uniform gray above with a light tip to the end of the rostrum. The gray specimens (such as No. 8682) were gray in life. One specimen (No. 8706) was described in the field as "yellowish gray above, tip of the snout a lighter tone; a brownish patch on the anus outlined with a pale yellow. Skin granular above, the larger granules yellowish. Iris golden with a dark brown outer edge."

Another specimen (No. 8683) was described as "dark brown above, sides a distinctly lighter tone; hind legs with irregular dark cross-bands; tip of the snout a pale yellowish; a spot of the same color below each eye; the denticulated ridge along the forearm and the spur on the heel tinged with the same light tone."

HABITS.—This last-mentioned specimen was caught "among yellowish leaves on the ground." The other specimens also were apparently taken on the forest floor.

None of the thirty-five specimens were found in copulation. Twenty-six of them are females, exhibiting an extraordinary irregularity of development in their sexual products. One specimen (No. 8708) taken in April 1914 at Medje contained eggs in its oviducts. These eggs averaged 3 mm. in diameter and were unpigmented. Other specimens taken at Medje in June 1914 and July 1910 contained in their ovaries eggs of nearly the same size. On the other hand, specimens taken at Niapu in January possessed fully developed ova. One of two specimens (Nos. 8685 and 8686) of identical size taken at Medje in July 1914 contained very large ova, while the other specimen had apparently just laid its eggs. The breeding season may occur in July but, since there is little uniformity in the degree of sexual maturity of specimens taken during July as well as the other months, it is probable that the breeding season is irregular. Very little data is available on the breeding season of any of the forest frogs.

Only a very small percentage of the stomachs contained food. The contents of thirteen stomachs consisted of 7 grasshoppers; 2 roaches; 2 spiders; 1 caterpillar; 1 cricket; and 2 ants.

Leptopelis aubryi (A. Duméril)

Plate XXXI, Figure 6; XXXVIII, Figure 1

Hyla aubryi A. Duméril, 1856, Rev. Mag. Zool., (2) VIII, p. 561 (type locality: Gaboon).

Hylambates aubryi Peters, 1878 (for 1877), Monatsber. Akad. Wiss. Berlin, p. 618 (Chinchoxo, Loango Coast). Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 135 (Ashanti, Gaboon, and the Gold Coast). Sauvage, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Congo). Vaillant, 1884, Bull. Soc. Philom. Paris, (7) VIII, p. 171 (Assini); Bull. Soc. Zool. France, IX, p. 353 (Assini: Effirou and Couacrou). Müller, 1885, Verh. Naturf. Ges. Basel, VII, p. 671 (Tumbo Island). Boettger, 1888 (for 1887–1888), Ber. Senck. Ges., p. 99 (Massabi, Loango Coast). Müller, 1890, Verh. Naturf. Ges. Basel, VIII, p. 257 (Tumbo Island). Boettger, 1892, 'Kat. Mus. Senck. Ges.,' p. 21 (Massabi, Loango Coast). Bocage, 1895, 'Herpétol. Angola,' p. 181 (Loango Coast: Massabi and Chinchoxo). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 158 (part: Usambara, German East Africa); 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Spanish Guinea: Cape St. John). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 20 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, pp. 168–169 (Buea, Cameroon). Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 242 (Bibundi, Cameroon). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 502 (Cameroon: Bipindi, Ebolowa; Spanish Guinea, Mokomo). Andersson, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 107 (part: Cameroon). Nieden, 1909, Arch. Naturg., LXXV, part 1, p. 365, figs. 1*c* and 2*c* (West Africa); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 55, figs. 112–114 (Victoria, Cameroon and localities of Nieden 1908); Sitzber. Ges. Naturf. Freunde Berlin, p. 448 (Amani, German East Africa). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Efulen, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 215 (Cameroon: Bibundi, Isongo, and Mowange). Andersson, 1913, Jahrb. Nassau. Ver. Naturk., LXVI, p. 78 (part: Bibundi, Cameroon). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 368 (Usambara, German East Africa). Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 460 (N'Zérékore, French Guinea).

Hylambates ocellatus Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 413 (Gaboon). Steindachner, 1906, Ann. Hofmus., Wien, XXI, p. 154 (Cameroon: Nyang District). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Ja River, Cameroon).

Nyctibates lævis Barbour,[1] 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 131, Pl. ii, fig. 1 (Efulen, Cameroon).

Seventy-one specimens, nearly all adult: Medje, one in January, sixteen in April–May, one in July and three in September 1910, one in January, two in March, three in April, two in May, seventeen in June and five in July 1914; Bafwaboli, seven in September 1909; Stanleyville, eight in August 1909; Niapu, one in November 1913 and two in January 1914; Avakubi, one in October 1909; Ngayu, one in December 1909; Vankerckhovenville, one in April 1912. (A. M. N. H. Nos. 8810–8873, 11261–11267.)

Distribution.—*L. aubryi* is apparently more restricted to the Rain Forest than its close relative *L. rufus*. Nieden (1915, p. 368) has shown that the several records of *L. aubryi* from Tanganyika Territory in regions beyond the forest should be credited to the latter species. He concludes (translation): "Amani is apparently the only place in Tanganyika Territory where this essentially West African species has until now been known, a fact which is not surprising, since there has been found in mountainous Usambara numerous West African forms as well as East African species."

There was only one region outside the Rain Forest where the expedition observed *L. aubryi* in any abundance. This was at Vankerckhovenville in a large patch of forest fringing the river. It was not taken at any of the other forest outlyers, such as those at Niangara or Faradje.

Relations.—*L. aubryi* cannot be confused with *L. rufus* if typical specimens are examined. Intermediate specimens in most cases will probably be found to be referable to *L. tessmanni*. The relation of *L. aubryi* to *L. tessmanni* is discussed in some detail under the latter species.

Variation.—Twenty of our seventy-one specimens are males. These differ markedly in size from the females. Ten of the sexually mature males average 44.4 mm. in length (head and body); maximum, 47 mm.; minimum, 40 mm. The average length of the same number of sexually mature females is 64 mm.; maximum, 75 mm.; minimum, 61 mm. The males possess two glandular circular areas on the chest, one at the base of each forelimb.

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[1] Type examined.

Our specimens show considerable variation in color. The ground color is some dull tone of gray, brown, or green. White spots are present on the dorsal surface of some specimens. These are very numerous on one specimen (No. 8857) from Bafwaboli, taken September 12, 1909. The ventral surface when pigmented is stippled with brown and there is no network of color as in *L. rufus*. In alcohol the dorsal color pattern is sometimes indistinct but in life there was always some indication of a pattern. The ground tone varied in life from a dark brown to a pale yellow, or from a dark bluish-gray to a light green. A pale yellowish line extended from the tip of the snout to half the length of the body in many of the specimens. Some indication of this line was present on all of them. A dark stripe was generally present below this line. One specimen (No. 8810), a photograph of which is reproduced on Plate XXXVIII, fig. 1, was described in life as follows: "General color above a light brown; on each side of the body a broad irregular band of gray, extending from the nostril to the lumbar region where it breaks up into a series of grayish-green blotches, this band edged above with a narrow, dark red line; wedge-shaped mark of dark brown on the back; head tinged with the same color, limbs indistinctly crossbanded; above the anus and on the heel a narrow line of yellowish or pinkish; ventral surface uniform white, shading into pink posteriorly; iris an irridescent golden bronze."

Habits.—At Vankerckhovenville in April (1912), *L. aubryi* was found mostly in the grass, on low bushes or among the leaves of large plants; at Medje in July (1910) chiefly on the ground, upon logs, or among other forest débris. At Bafwaboli in September (1910) many frogs of this species were "taken at night with the help of a candle. They were found sitting on leaves of young oil palms planted recently at the station where most of the natural vegetation had been destroyed. The frogs called only at night when they uttered deliberately at short intervals a sharp musical note."

The breeding season of *L. aubryi* may be extended from April through June or longer. One specimen (No. 8843) taken at Medje in April 1914 had a number of eggs in its oviducts. Other specimens from Medje taken as late as June had the ovaries greatly distended with large ova. Another specimen (No. 8858) taken September 12, 1909 at Bafwaboli still possessed large ova. *L. aubryi* is potentially ready for oviposition throughout several months.

Most of the stomachs examined contained little food. The contents of only twenty-seven were identifiable. The food consisted of 13 caterpillars; 9 grasshoppers (and fragments of others); 6 snails (*Helixarion*, etc.); 3 spiders; 2 beetles; 2 crickets; 1 winged ant; 1 slug (Vaginulidæ); and a considerable amount of leaves and other extraneous matter.

Leptopelis rufus Reichenow

Plate XXXVII

Leptopelis rufus Reichenow, 1874, Arch. Naturg., XL, part 1, p. 291, Pl. ix, figs. 1*a* and 1*b* (type locality: Victoria, Cameroon, at foot of Cameroon mountains).

Hylambates rufus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 136 (Gaboon, Cameroon, and Fernando Po). Sauvage, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, Congo). Boulenger, 1900, Proc. Zoöl. Soc. London, p. 445 (Fernando Po, Cameroon and Gaboon). Bocage, 1903, Jorn. Sci. Lisboa, (2), VII, p. 45 (Fernando Po). Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Spanish Guinea: Cape St. John). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 18 (part: Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 169 (Cameroon: Buea; Fernando Po: Punta Frailes and Basilé; French Congo: Fernando-Vaz). Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 240 (Bibundi, Cameroon). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 505 (Cameroon: Victoria, Johann-Albrechtshöhe, and Bipindi; Spanish Guinea: Makomo; and Fernando Po); 1909, Arch. Naturg., LXXV, part 1, Figs. 1*b*, 2*b*, and 3*a* (West Africa). Krefft, 1910, Blätter Aquar. Terr. Kunde, XXI, p. 463 (German East Africa). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Cameroon). Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 447 (Amani, German East Africa); 'Fauna Deutschen Kol.,' (1) Heft 2, p. 56, figs. 115, 117, and 118 (localities of Nieden, 1908, except for Fernando Po). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Kribi, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 216 (Cameroon: Bibundi and Isongo). Boulenger, 1912, in Talbot, 'In the Shadow of the Bush' (Nigeria). Nieden, 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 179 (Lake Region, five localities). Werner, 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 320, Pl. iii, figs. 3 and 4. Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 368 (German East Africa: Tanga, Usambara, Amani, Derema, and Nguru).

Hylambates millsonii Boulenger, 1894, Proc. Zoöl. Soc. London, p. 644 (mouth of the Niger). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 135 (Ja River, Cameroon).

Hylambates anchietæ Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 157 (German East Africa: Forest of Magila and Usegua, Verneleguidé, west of Lake Albert); 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). (Not of Bocage.)

Hylambates aubryi Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 158 (part: Tanga, German East Africa). (Not of A. Duméril.)

Hylambates aubryi Andersson, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 107, fig. 3 (part: Cameroon), (not of A. Duméril); 1913, LXVI, p. 79, fig. (Bibundi, Cameroon).

Hylambates rufus var. *boulengeri* Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 197 (Victoria, Cameroon). Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 241 (Bibundi, Cameroon).

Hylambates rufus var. *modesta* Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 197 (Cameroon).

Hylambates rufus var. *ventrimaculata* Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 198 (Cameroon).

Hylambates rufus var. *aubryoides* Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 241 (Bibundi, Cameroon).

Eighty-three specimens: Medje, 1910, one in January, fourteen in April, four in August, and two in September; 1914, one in March, ten in April, seven in May, thirty in June, and two in July; Gamangui, two in February 1909 and one in January 1910; Niapu, five in January 1914; Batama, one in September 1909; Ngayu, one in December 1909; Niangara, one in November 1910; and Poko, one in August 1913. (A. M. N. H. Nos. 8713–8795.)

Distribution.—*L. rufus* has been recorded from several localities in Tanganyika Territory where no large forests occur. The species may be considered a true forest inhabitant which has migrated along the wooded river-banks beyond the limits of the forest. It is also possible that the forest once had a greater extent; especially is this true in Tanganyika Territory. The American Museum expedition found the species only in the Rain Forest and outlying forest island of Niangara.

Relations.—Of the various species which have been confused with *L. rufus* in the past, *L. palmatus* and *L. brevirostris* require special consideration. Both these species are confined to the Cameroon-Gaboon area (except for one doubtful record of *L. brevirostris* in Tanganyika Territory) and afford further evidence of this region being a center of specialization for the frogs and toads.

The adult of *L. palmatus* is distinctly larger than any specimen of *L. rufus* which I have examined. One specimen (M. C. Z. 2454) measures 83 mm. from snout to vent, two others (M. C. Z. 2745 and 2665) measure 81 mm. and 80 mm. respectively. The web between the fingers is more extensive than in any specimen of *L. rufus* before me. As Andersson (1909, p. 105) has pointed out, Boulenger (1882, p. 136) in his catalogue exaggerated the extent of the web. But a comparison of Peters' (1869, Pl. ii) original figure with any specimen of *L. rufus* will show that the web between the second and third fingers is more extensive in *L. palmatus* than in the latter species.

Although Nieden (1909) recognized *L. palmatus* as distinct from *L. rufus,* he made *L. brevirostris* a "variety" of the latter. *L. rufus* exhibits an extraordinary range in head-form but in all the eighty-three specimens of our series and in the numerous specimens of this species in the Museum of Comparative Zoölogy I find none which show that the species intergrade. The dorsolaterally placed tympanum is the most striking feature of *L. brevirostris*, but I have seen no specimen of *L. rufus* that is so coarsely granular above as the several specimens of *L. brevirostris* examined. The two specimens of that species in the American Museum possess very short omosternums (Plate XXXI) distinctly different from *L. rufus*. It seems to me that the buccal nursing habits of *L. brevirostris* may represent further evidence of its specific identity.

I have referred *L. millsonii* to the synonymy of *L. rufus* because I find nothing in the original description to distinguish it from that species. The only specimen of the former species available for study is an immature individual (M. C. Z. 2647) from the Ja River, Cameroon. This specimen is identical with young specimens of *L. rufus* in our series.

VARIATION.—There are only sixteen males in our series. Ten of the sexually mature ones average 45.6 mm. in length (maximum, 50 mm.; minimum, 42 mm.). In contrast to this, ten sexually mature females average 68.3 mm. (maximum, 73 mm.; minimum, 65 mm.). It is indeed strange that both the smallest and largest sexually mature female in our series of sixty-seven should contain eggs in the oviducts. The former (No. 8730) is 52 mm. in length and the latter (No. 8727) 73 mm.

The majority of the specimens are a uniform grayish blue above, or a reddish brown stippled with a darker tone. The sides of most are a grayish brown spotted with white. A number of smaller spots are scattered over the back of a few of the specimens. In eighteen of the specimens the grayish brown of the sides is extended over the chest and abdomen in the form of a network. In most of the specimens in our series this network is only partly developed, being restricted to the throat and sides of the abdomen. Twenty-five have a uniform whitish under-surface. The reddish-brown specimens have generally a number of large dark brown spots above. These sometimes tend to form crossbars on the back.

Specimens taken at Medje in March, June, August, and January were reddish brown in life, with some indication of darker markings on the back and across the limbs. In some specimens a light spot was present under the eye and there was a sprinkling of fine light spots on the posterior part of the body. In a few specimens the brown shaded off into a gray on the sides. Others were distinctly tinged with green.

The photograph of one specimen taken at Niapu in January 1914 is reproduced on Plate XL, fig. 1. This specimen (No. 8732) was described in life as follows: "Greenish brown above, faintly stippled with yellowish; a series of very delicate transverse stripes of a golden tone extending across the back; the stripe between the eyes and those in the lumbar region more distinct than the others, which are confluent and not very distinct from the ground tone; sides of the body a lustrous green, the legs a grayish green, and the digital expansions a pale yellowish-brown; a narrow line of yellowish white above the arms; posterior surfaces of the thighs and sides of the body spotted with the same color; ventral surface yellowish faintly reticulated with purplish."

HABITS.—The specimen described above was found "under dry leaves in a moist situation. When picked up it emitted at short intervals a loud squeal. The dry season had lasted nearly two months and this tree frog, as all the other frogs and toads, had hidden itself away."

"During the rainy season the tree frogs were usually found sitting beneath the leaves of plants which fringe the plantations. Specimens taken at Medje in March were found on shrubbery or lianas a short distance above the ground."

The breeding season of *L. rufus* is very probably extended through several months. One specimen (No. 8733) taken at Medje in June 1914, has eggs in its oviducts, while another (No. 8730) from the same locality, taken August 4, 1910, exhibits the same condition. Specimens with distended ovaries were taken at Medje, in March (1914) and at Ngayu in December (1909). It is therefore possible that the breeding season of *L. rufus* may be a little later than that of *L. aubryi*, but it is more probable that the two seasons greatly overlap. This latter probability would lend further support to my suggestion (see below) that *L. tessmanni* is a hybrid of *L. rufus* × *L. aubryi*.

Only forty-five stomachs contained food. This consisted of 22 grasshoppers; 15 beetles; 12 caterpillars; 5 spiders; 2 mantids; 2 roaches; 2 ants; 1 heteropterous insect; 1 moth; 1 cricket; and 1 myriopod.

Leptopelis tessmanni (Nieden)

Hylambates tessmanni NIEDEN, 1909, Arch. Naturg., LXXV, part 1, p. 365, figs. 4*a* and 4*b* (Makomo, Spanish Guinea).

Hylambates aubryi ANDERSSON, 1909, Jahrb. Nassau. Ver. Naturk., LXII, p. 107 (part: Cameroon); 1913, LXVI, p. 78 (part: Bibundi, Cameroon).

Twenty-four specimens, all from Medje, three taken in April, three in May, nine in June, and four in July 1914; one taken in March, two in

April-May, one in August, and one in September 1910. (A. M. N. H. Nos. 8796–8809; 11268–11277.)

Distribution.—*L. tessmanni* will probably be shown to be confined to the Rain Forest. The specific status of the species is not at all well understood and little may be said at this time as to its range.

Relations.—The twenty-four specimens listed above would doubtlessly be referred by Nieden to *L. tessmanni*. They form a very uniform series intermediate between *L. aubryi* and *L. rufus* but showing no intergradations into either species. They possess the following:

L. rufus characters.—(1) Third and fifth toe webbed to the base of the terminal phalanges;

(2.) No indication of a dorsolateral line behind the tympanum;

L. aubryi characters.—(1) Fingers less than one-third webbed;

(2.) Ventral pigmentation when present, stippled, never forming a network.

Special Characters.—Average size larger than either *L. aubryi* or *L. rufus* (including the largest females); average head and body length of fifteen specimens 73.2 mm.; maximum, 79 mm.; minimum, 60 mm.

From the above list, it would seem that *L. tessmanni* is a distinct species intermediate between but larger than either *L. rufus* or *L. aubryi*. Still, there is one remarkable feature about this series of specimens. In spite of their large size and the fact that they were taken at various seasons, none of the specimens are sexually mature. More than half of them have the gonads rudimentary and only two specimens (Nos. 11276–11277) show any signs of their ovaries developing beyond an immature condition.

Two possibilities are suggested by the above facts. Either these large specimens are very immature (except the two specimens mentioned) or they are sterile adults. With the material before me, I am inclined to the latter view. The possibility then arises of their being hybrids of the two species they resemble, *L. aubryi* and *L. rufus*. But hybrids in nature are very little known and it is not at all certain that hybrids formed from a cross of two related species of frog would be sterile. Born (1886, p. 263), in discussing this latter difficulty, states (translation):

> In most cases, however, where not only fertilization but also development progresses regularly nature assures the integral preservation of the species in that the hybrid becomes sterile.

This statement has not been entirely confirmed by the experiments of recent years. Further evidence is needed. For the present we cannot regard *L. tessmanni* as anything more than a very interesting form intermediate between *L. aubryi* and *L. rufus*, but larger than either and, unlike any other species of *Leptopelis*, exhibiting a high percentage of sterility.

Variation.—All the specimens in the series are a nearly uniform bluish green above, without any indication of a dorsal pattern. They were described in life as "bright green above, with no markings of any sort; the yellow line on the posterior limbs restricted or absent." Others were described as changing from this uniform green to a uniform brown.

Habits.—The stomachs of five specimens examined contained fragments of orthopterous insects only.

HYLAMBATES A. Duméril

The status of this genus has been discussed above and its composite nature indicated. The species which at the present time must be referred to this genus may be distinguished by the following key.

- a_1.—Fingers free.
  - b_1.—Toes slightly webbed at base.
    - c_1.—Tibiotarsal articulation not reaching beyond shoulder; metatarsal tubercle weak, not compressed.................... *H. cassinoides.*
    - c_2.—Tibiotarsal articulation reaching between shoulder and eye; metatarsal tubercle strong, compressed.
      - d_1.—Tips of fingers and toes scarcely dilated.
        - e_1.—Foot not more than half length of head and body. . *H. bocagii.*
        - e_2.—Foot more than half length of head and body. . *H. marginatus.*
      - d_2.—Tips of fingers and toes distinctly dilated.
        - e_1.—Skin finely areolate above...................... *H. hyloides.*
        - e_2.—Skin with scattered warts above.............. *H. verrucosus.*
  - b_2.—Toes at least half webbed.
    - c_1.—Metatarsal tubercle strong, very prominent............ *H. argenteus.*
    - c_2.—Metatarsal tubercle weak, feebly prominent.
      - d_1.—Tibiotarsal articulation reaching eye; vomerine teeth just behind level of choanæ............................ *H. leonardi.*
      - d_2.—Tibiotarsal articulation not reaching eye; vomerine teeth on level with posterior border of choanæ.......... *H. maculatus.*
- a_2.—Fingers more or less webbed.
  - b_1.—Fingers less than one-third webbed.
    - c_1.—Toes more than half webbed......................... *H. greshoffii.*
    - c_2.—Toes webbed half way, three distal phalanges of fourth toe and two of fifth free.
      - d_1.—Metatarsal tubercle weak, not compressed.
        - e_1.—Tibiotarsal articulation reaching tympanum..... *H. ragazzii.*
        - e_2.—Tibiotarsal articulation reaching eye or further.
          - f_1.—Upper parts smooth.................. *H. vermiculatus.*
          - f_2.—Upper parts with scattered small round warts. *H. vannutellii.*
      - d_2.—Metatarsal tubercle strong, compressed.
        - e_1.—Vomerine teeth between choanæ; tibiotarsal articulation reaching eye or a little beyond.......... *H. johnstoni.*

e_2.—Vomerine teeth behind choanæ.
  f_1.—Tibiotarsal articulation not reaching eye . . . *H. brevipes.*
  f_2.—Tibiotarsal articulation reaching eye or beyond.
    g_1.—Tibiotarsal articulation reaching eye . . . . *H. christyi.*
    g_2.—Tibiotarsal articulation reaching end of snout. *H. haugi.*
b_2.—Fingers at least one-third webbed, toes more than half webbed. *H. natalensis.*

Hylambates verrucosus Boulenger

Plate XXXVIII, Figure 3

Hylambates verrucosus Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141 (type locality; Mabira Forest, Chagwe, Uganda).

Two adults of opposite sex, taken at Medje, the female in March and the male in May 1914. (A. M. N. H. Nos. 8665–8666.)

Distribution.—The American Museum expedition's fortunate discovery of this species in the Ituri forest affords further evidence of the homogeneity in fauna between the Rain Forest and the outlying forests of Uganda.

Relations.—The species was formerly known only from a single female. The male possesses the two gular vocal sacks separated by a gular pad as in *H. leonardi.* While *H. verrucosus* is perhaps closely related to *H. leonardi,* it is readily distinguishable from this and all other species of *Hylambates* by its unique coloration, especially by the large patches of "flash color."

Variation.—Boulenger, in his original description of the species, states that the toes are barely one-fourth webbed. In our specimens the fourth toe is webbed for about one-fourth its length. The first toe is not webbed, the second is webbed to the distal end of the metatarsal, the third and fourth toes to the distal end of the proximal phalanx and the fifth to slightly beyond this point. It is evident that Boulenger's expression applies only to the longest toe.

Our two specimens are nearly identical in coloration. In the female the dorsal surface is not so dark as that of the male and an indistinct pattern of a number of darker spots is visible. The orange "flash colors" have faded in alcohol to a yellowish white. The ventral surfaces of both specimens are not uniform dark purplish brown as described by Boulenger for the type, but are closely stippled with yellowish white. In life the specimens were browner, and the indistinct blotches appeared black. The iris was a dark bronze color of nearly a uniform tone.

The male is readily distinguishable from the female. It possesses vocal sacs already mentioned and is smaller in size, measuring 48 mm.

from snout to vent, in contrast to 53 mm., the length of the female. Almost as striking a character, which I take to be entirely sexual, are the numerous white asperities which entirely cover the dorsal surface of the male. In addition to these asperities, the male possesses the large flat warts of the female, but the asperities are minute and bear no relation to the warts.

Habits.—The female, taken in March, possessed very mature ova, suggesting that the breeding season may occur shortly after this month. When captured, the male appeared "very sluggish, preferring to crawl into the crevices of a palm tree than to leap away from its captors."

The stomach of the two specimens contained the unidentifiable fragments of several insects.

Hylambates greshoffii Schilthuis

Hylambates greshoffii Schilthuis, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 286, Figs *a* and *b* (type locality: Boma, Belgian Congo). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, pp. 168 and 171 (refers to type). Nieden, 1909, Arch. Naturg., LXXV, part 1, p. 336 (refers to type).

A single adult male taken at Stanleyville, August 13, 1909. (A. M. N. H. Nos. 8667.)

Distribution.—It is thirty years since *H. greshoffii* was made known to science and since that time no specimens, to my knowledge, have hitherto been secured. The fact that our single specimen was taken at Stanleyville suggests that the type may have been collected in the forested area north of Boma and that the species may have a wide distribution in the Rain Forest.

Relations.—Boulenger (1906) has compared the species with *H. leonardi* and Nieden (1909) with *H. tessmanni.*

In external features *H. greshoffii* is very distinct from any other species of *Hylambates* or any species of the allied genus *Leptopelis.* Its completely webbed toes, nearly webless fingers, smooth skin, and uniform coloration readily distinguishes *H. greshoffii* from these forms. It is apparently related to *H. leonardi,* but is remarkable in lacking the gular vocal sacs and gular pad characteristic of that related species.

Variation.—Our specimen agrees entirely with the brief description of Schilthuis. To this description it may be added that the tibiotarsal articulation reaches the middle of the eye, that the tibia is contained 2.1 times into the head and body length, and that the disks of the digits are not quite as large as the tympanum. In alcohol the specimen is a uniform reddish brown above and white below. In life the dorsal surface was "a light rusty brown, very waxy in appearance. The brown tone graded off into an orange red on the digits and into a pink on the throat. The belly was a yellowish white, fading gradually into the yellowish brown of the sides. The iris was of the brilliancy and color of an emerald, in sharp contrast to the sombre tones of the body."

HABITS.—The single specimen was caught on the ground in a coffee plantation. Its alimentary tract contained the wings of a grasshopper.

HYPEROLIUS Rapp

In no genus of frogs are there so many undefinable, intergrading species as in *Hyperolius*. It is the most dominant tree frog of Africa and yet systematically it is the most unsatisfactory. *Eleutherodactylus* of the American tropics perhaps affords a close parallel but this is apparently an older genus where specialization has proceeded to a greater extent and we do not find the great structural uniformity of *Hyperolius*.

The number of described species of *Hyperolius* has become so large, and the differences employed appear so trivial, that many herpetologists have either left certain of their species unidentified in their reports or have omitted the genus entirely. Nieden (1912 and 1915) refused to complicate the already involved synonymy of *Hyperolius* by referring the numerous specimens which he had before him to any of the described species. Werner (1907) did exactly the opposite; after admitting that "the more than fifty described species of this large and difficult genus" were too intangible for him he proceeded to describe as new all the species in his collection. This extreme rashness may have been due to the example of recent workers; some years before he (1898) left one of the species of *Hyperolius* he was considering *sp. indet.* Bocage (1896), Müller (1910), Andersson, (1911) and Klaptocz (1913) have adopted this latter system of ridding themselves of the more troublesome specimens. Others, such as Pfeffer (1892) and Hewitt (1911) have simply deplored the confusion into which the species of *Hyperolius* have been thrown, but they have contributed little to help matters.

It was at once obvious that with the few species of *Hyperolius* available in the museums in America I could contribute little of value to the problem. Nevertheless, I append a rough key to the sixty-one species I consider valid and a table of their reported distribution in Africa. A comparison of the key with the variation discussions under the species will show some great discrepancies. The key has been compiled from the literature, and at least it may serve as a check on the published descriptions. I have found both the key and the table useful in my work on the genus and, if considerable allowances are made for the incorrect identification by early authors, both key and table should be useful to future workers.

The first synthetic work on the genus *Hyperolius* was attempted by Tornier (1896). Unfortunately, he lost sight of the natural groups as exhibited by structural features and contiguous ranges. Without any insight into the genetic relations of the species he arranged all the specimens he could secure in a number of series (often representatives of one species in several different series) just as anyone might do with almost any group of vertebrates exhibiting great variation in color pattern. I fail to see that Tornier's elaborate plate (1896, Pl. III) is a distinct contribution to the phylogeny of the genus, for, in order to show that the color variations could be arranged in a series, Tornier has utterly disregarded the few constant characters of structure. Our study of the genus shows that coloration is not always present, but, when the pattern is complete, it has a constant form in each species. Variation is thus limited within each species to a fading of a definite pattern (possible exceptions in certain species such as *H. marmoratus*). This fading is well shown for *H. symetricus* by Andersson (1911, Pl. I, figs. 2*a*–2*e*). Studies in variation within the species will do much to untangle the synonymy of the many undefinable species of *Hyperolius*.

Résumé of the African Species of *Hyperolius*

a_1.—Outer fingers less than a third webbed.
  b_1.—Tibiotarsal articulation reaching not beyond eye.
    c_1.—Uniform above (excluding sides of head). . *H. aylmeri, H. concolor, H. platyrhinus, H. pusillus.*
    c_2.—Spotted above (with or without a lateral stripe). . *H. pleurotænius, H. riggenbachi, H. vermiculatus, H. tristis.*
    c_3.—Striped above. . . . . *H. molleri, H. spurrelli.*
    c_4.—Striped or spotted on sides only. . . *H. balfouri, H. bivittatus, H. cinnamomeo-ventris.*
    c_5.—Occipital spot and a more or less confluent median pattern. . *H. platyceps.*
  b_2.—Tibiotarsal articulation reaching beyond eye.
    c_1.—Uniform above. . . . . *H. thomensis.*
    c_2.—Spotted or stippled above. . *H. sansibaricus, H. benguellensis, H. nasutus, H. platycephalus, H. punctulatus.*
    c_3.—Marbled and spotted above. . . . . *H. pliciferus.*
    c_4.—Striped above. . . . . *H. granulatus, H. quinquevittatus.*
    c_5.—Striped or spotted on sides only.
      H. cinctiventris, H. osorioi, H. sugillatus.
a_2.—Outer fingers one-third or more webbed.
  b_1.—Tibiotarsal articulation extending not beyond eye.

c_1.—Uniform above (typically so)........*H. pachydermus*, *H. steindachnerii.*
c_2.—Spotted or stippled above....*H. argus*, *H. guttatus*, *H. guttulatus*, *H. sordidus*, *H. viridiflavus.*
c_3.—Marbled above........................*H. ferniquei*, *H. marmoratus.*
c_4.—Striped above.......................*H. fulvovittatus*, *H. oxyrhynchus.*
c_5.—Striped or marbled on sides only..*H. bayoni*, *H. fasciatus*, *H. flavoviridis*, *H. fusciventris*, *H. picturatus*, *H. fuscigula*, *H. rhodoscelis*, *H. H. fimbriolatus*, *H. burgeoni.*
c_6.—Occipital spot and a more or less confluent median pattern. *H. symetricus*, *H. undulatus.*

b_2.—Tibiotarsal articulation reaching beyond eye.
c_1.—Two irregular, more or less diagonal zones of color above. *H. phantasticus.*
c_2.—Uniform above........................*H. salinæ*, *H. tuberilinguis.*
c_3.—Spotted or stippled above........*H. bocagei*, *H. langi*, *H. ocellatus.*
c_4.—Marbled above.................................*H. lagoensis.*
c_5.—Striped above.....................................*H. toulsonii.*
c_6.—Striped or marbled on sides only.......*H. burtonii*, *H. chlorosteus*, *H. horstockii*, *H. microps*, *H. seabrai.*
c_7.—A symmetrical spot and a more or less median pattern..*H. acutirostris.*

	Forest			Open Country				
Species	Portuguese Guinea-Nigeria	Cameroon-Gaboon	Upper Congo	Lower Congo	Angola	Senegambia Sudan	East Africa	South Africa
Hyperolius acutirostris Buchholz and Peters	×	×	×					
Hyperolius argus Peters							×	×
Hyperolius aylmeri (E. G. Boulenger)	×							
Hyperolius balfouri (Werner)						×		
Hyperolius bayoni (Boulenger)							×	
Hyperolius benguellensis (Bocage)					×			
Hyperolius bivittatus (Ferreira)					×			
Hyperolius bocagei Steindachner					×			
Hyperolius burgeoni (Witte)			×					
Hyperolius burtonii (Boulenger)	×							
Hyperolius chlorosteus (E. G. Boulenger)	×							
Hyperolius cinctiventris Cope				×	×	×	×	×
Hyperolius cinnamomeo-ventris Bocage					×			
Hyperolius concolor (Hallowell)	×	×			×	×	×	×
Hyperolius fasciatus (Ferreira)					×			
Hyperolius ferniquei (Mocquard)							×	
Hyperolius fimbriolatus Buchholz and Peters		×		×				
Hyperolius flavoviridis Peters							×	
Hyperolius fulvovittatus Cope					×		×	

Species	Forest				Open Country			
	Portuguese Guinea-Nigeria	Cameroon-Gaboon	Upper Congo	Lower Congo	Angola	Senegambia Sudan	East Africa	South Africa
Hyperolius fuscigula Bocage	×	×		×	×			
Hyperolius fusciventris Peters	×	×						
Hyperolius granulatus (Boulenger)							×	
Hyperolius guttatus Peters	×	×						
Hyperolius guttulatus Günther	?							
Hyperolius horstockii (Schlegel)								×
Hyperolius lagoensis (Günther)	×							
Hyperolius langi Noble			×					
Hyperolius marmoratus Rapp	×	×	×	×	×		×	×
Hyperolius microps Günther		?			×		×	?
Hyperolius molleri (Bedriaga)		×						
Hyperolius nasutus Günther				×	×	×	×	×
Hyperolius ocellatus Günther		×	×		×			
Hyperolius osorioi (Ferreira)					×			
Hyperolius oxyrhynchus (Boulenger)							×	
Hyperolius pachydermus (Werner)						×		
Hyperolius phantasticus (Boulenger)		×	×					
Hyperolius picturatus Peters	×	×	×				×	
Hyperolius platycephalus (Pfeffer)							×	
Hyperolius platyceps (Boulenger)		×			×			
Hyperolius platyrhinus (Procter)							×	
Hyperolius pleurotænius (Boulenger)		×	×					
Hyperolius pliciferus (Bocage)					×			
Hyperolius punctulatus (Bocage)					×			
Hyperolius pusillus (Cope)	×	×		×	×	×		×
Hyperolius quinquevittatus Bocage			×		×			
Hyperolius rhodoscelis (Boulenger)							×	
Hyperolius riggenbachi (Nieden)		×						
Hyperolius salinæ (Bianconi)							×	
Hyperolius sansibaricus (Pfeffer)							×	
Hyperolius seabrai (Ferreira)					×			
Hyperolius sordidus (Fischer)	×	×	×					
Hyperolius spurrelli (Boulenger)	×							
Hyperolius steindachnerii Bocage		×	×		×			
Hyperolius sugillatus Cope								×
Hyperolius symetricus (Mocquard)							×	
Hyperolius thomensis Bocage		×						
Hyperolius toulsonii Bocage					×			
Hyperolius tristis Bocage				×	×			
Hyperolius tuberilinguis Smith								×
Hyperolius undulatus (Boulenger)							×	×
Hyperolius vermiculatus (Pfeffer)							×	
Hyperolius viridiflavus (Duméril and Bibron)							×	

Hyperolius concolor (Hallowell)

Plate XXXIX, Figure 3

Ixalus concolor Hallowell, 1844, Proc. Acad. Nat. Sci., Philadelphia, p. 60 (type locality: Liberia).

Rappia concolor Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 124 (Gold Coast, Shiré Valley and Portuguese East Africa: Quilimane). Fischer, 1884, Jahrb. Hamburg. Wiss. Anst., I, p. 27 (vicinity of Naivasha Lake). Müller, 1890, Verh. Naturf. Ges. Basel, VIII, p. 257 (Zanzibar). Boulenger, 1891, Proc. Zoöl. Soc. London, p. 308 (Shiré Valley). Matschie, 1892, Sitzber. Ges. Naturf. Freunde Berlin, p. 110 (German East Africa); 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togoland); 1894, Proc. Zoöl. Soc. London, p. 88 (Njemps, British East Africa). Bocage, 1895, 'Herpétol. Angola,' p. 173 (Angola: Duque de Bragança, Huilla, Caconda, Rio Quando and Bihé); 1896, Jorn. Sci. Lisboa, (2) IV, pp. 101 and 211 (Mozambique and Angola: Hanha). Tornier, 1896, 'Kriechthiere Deutsch Ost-Afrikas,' p. 146 (part: German East Africa). Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 19 (Lambaréné, Gaboon). Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero). Bocage, 1903, Jorn. Sci. Lisboa, (2) VII, p. 54 (Prince's Island). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Prince's Island, St. Thomas and Portuguese Guinea: Bolama). Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 237 (Bibundi, Cameroon). Boulenger, 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands); Ann. Natal Mus., I, p. 223 (Zululand: Lower Umbiluzi); 1909, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 304 (Sesse Islands). Roux, 1910, Rev. Suisse Zool., XVIII, p. 102 (Bukoba, German East Africa). Andersson, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 32 (Mount Kenia). Hewitt, 1911, Rec. Albany Mus., II, p. 223 (partial summary of above localities). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 78 (Bibundi and Isongo, Cameroon). Peracca, 1912, Ann. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 8 (Rhodesia: Lake Bangueolo). Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 346 (Zanzibar). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 375. Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 456 (Agouagon, Dahomey). Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 457 (French Guinea and Liberia: several localities).

Fifty-four specimens: thirty-two from Vankerckhovenville, April 1912; five from Garamba in April, three in May and one in June 1912; one from Faradje in February and another in April 1911; four from the same locality in March, and two in October 1912; three from Niangara, June 1913; and two from Poko, August 1913. (A. M. N. H. Nos. 9984–9999, 10800–10837.)

Distribution.—The systematic status of *H. concolor* is very unsatisfactory, making the reported distribution of the species equally puzzling. The American Museum expedition found the species only in the open country lying to the north of the forest. The species is typically a savannah form with an extreme range in the Sudan, East Africa, and Angola and with reported occurrences in the Rain Forest.

Relations.—Our specimens average in coloration distinctly different from any described species of *Hyperolius*. Structurally they are identical with the type (A. N. S. P. 3216) of *H. concolor;* in the shape of the head, the extent of the digital webbing and the leg-length they agree entirely with it. The color of the type specimen has completely faded,[1] both dorsal and ventral surfaces being a uniform white. The original description of *H. concolor* is brief. A few of our specimens agree entirely with it but the majority are very different. A dorsolateral stripe of bluish gray and a fine speckling of dark brown appear in most of the specimens. The ground color is some tone of brown and not green as Boulenger (1882) has added to the description of the species. Mocquard (1897) has found a dorsolateral stripe in his specimens of *H. concolor* and Andersson (1907) mentions a speckling. Still, it seems obvious that several authors at least have not had the same species at hand when discussing specimens which they referred to *H. concolor.* Our specimens are certainly very near to the type of that species, differing only in an inconstant color feature. It is this inconsistency of the blue-gray dorsolateral line and dark speckling which prohibits the separating of our Sudanese specimens from typical *H. concolor* of Liberia.

Judging only from the descriptions, I would be inclined to refer, first of all, *H. balfouri* to the synonymy of this species. *H. sansibarica* is supposed to differ from *H. concolor* in lacking the webs between the fingers. The webs are rudimentary but very distinct in our series of the latter species. *H. salinæ* has been described with half-webbed fingers, but no other striking feature distinguishes it from *H. concolor.* Without an examination of the types of these related species, any change in the synonymy would lend further confusion, especially since many of the related species have been inadequately defined.

Variation.—The series of thirty-two specimens taken at Vankerckhovenville during April 1912 shows a great range of variation, practically as much as is exhibited by our entire series. The general color above varies from a yellowish gray to a dark chocolate-brown. The majority of the specimens have some indication of the slaty-blue dorsolateral stripe. Nine of the thirty-two specimens lack the speckling above. Of these nine only two have no trace of the dorsolateral line and are therefore identical with the type of *H. concolor* as originally described (except for the ventral staining of the type). The ventral surfaces of our specimens are uniformly yellowish, sometimes stippled with brown on the chin. In a few of the specimens the abdomen and ventral surface of the legs are darker, but apparently due to discoloration.

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[1] In this connection I may add that the type specimen of *H. fulvovittatus,* although still in the collections of the Philadelphia Academy of Natural Sciences, has become reduced to a few bones and fragments of white skin.

The variation occurring in life is well summed up in the field description for five specimens (Nos. 10819–10823) from Garamba, taken April 14, 1912: "General color above pale buff to gray; iris pale bronzy to dark bronzy and showing considerable variegation in the same individual; dorsolateral stripes grayish green to dark gray; pads, underside of the thigh, outer side of the lower leg bright pinkish; ventral surface whitish."

Habits.—Specimens taken during April, May and June show the greatest development of the ovaries. The breeding season may be an extended one.

Of those stomachs examined only eight contained food. This consisted of 2 winged termites; 1 caterpillar, 1 moth; and fragments of various insects, mostly beetles.

Hyperolius pusillus (Cope)

Crumenifera pusilla Cope, 1862, Proc. Acad. Nat. Sci. Philadelphia, p. 343 (type locality: Umvoti, Natal).

Rappia pusilla Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 127 (same locality, erroneously stated "Umvoti, West Africa"). Schilthuis, 1889, Tijd. Neder. Dier, Ver., (2) II, p. 286 (Boma, Belgian Congo). (Species doubtfully recorded.) Boulenger, 1890, Proc. Zoöl. Soc. London, p. 324 (Brass, Niger). Müller, 1890, Verh. Naturf. Ges. Basel, VIII, p. 688 (Brass, Nigeria). Sclater, 1899, Ann. S. African Mus., I, p. 108 (South Africa). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 445 (Niger Delta to Gaboon). Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 410 (Gaboon). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 17 (Cameroon). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Cameroon). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). Nieden, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 61 (Cameroon). Hewitt, 1911, Rec. Albany Mus., II, pp. 210 and 224.

Forty-one specimens: twenty-five from Garamba in May and six in June 1912; two from Faradje in April 1911; two from the same locality in March and one in October 1912; two from Vankerckhovenville, April 1912; one from Niangara, June 1913; one from Matadi, December 1914; and one from Zambi, June 1915. (A. M. N. H. Nos. 10838–10878.)

Distribution.—Our specimens are all from the open country lying to the north or the south of the forest. The only Rain Forest specimens referred to *H. pusillus* which I have been able to examine are those recorded by Barbour (1911, p. 133) from Cameroon. At least one of these (M. C. Z. 2746) is identical with specimens I have considered *H.*

ocellatus and differ widely both in structure and color from the original description of *H. pusillus.* It seems to me that other forest records for that species may prove referable to other species and that *H. pusillus* will be found to occur only in the open country. The present known range of *H. pusillus* extends from the Sudan to Natal.

RELATIONS.—*H. pusillus* is one of the least understood species of the genus. It was described as having an "incomplete" pattern, and many workers have referred to it their specimens which possessed only a partially developed pattern, although a larger series might have shown that they were not considering the same species. In our series of specimens, those of minimum coloration are inseparable from *H. pusillus* as originally described, but the highly colored specimens differ greatly from any described species. Our series exhibits a gradual change from a pale brownish ground color and dark frenal stripe characteristic of *H. pusillus* to a yellowish ground tone covered with evenly spaced pink spots, then to a net pattern of black regularly arranged about the spots, and finally to almost a uniform black dorsal surface with only a slight indication of the pink spots, which in this stage appear very much like mould or growths of fungus.

Our specimens agree entirely with *H. pusillus* structurally. The vocal sac in the male has the deep posterior pockets, but the "median frenum" is not always distinct. Except for the elaborate vocal apparatus with its broad gular disk the pale specimens in our series are identical with *H. citrinus* Günther (1864, Pl. XXVII, fig. 2). This species has been generally referred to *H. cinctiventris*, from which it seems to differ in color. Although *H. cinctiventris* has been recorded by Günther (1888) from the region where most of the above specimens were found, it is, nevertheless, unrepresented in our collection.

With the extraordinarily great range of color variation exhibited by our series of *H. pusillus*, it is obvious that many described species may possibly be referable to this one. Slight differences appearing in the original descriptions would probably disappear in a large series of specimens, but lack of comparative material has prevented me from reducing the more questionable species to synonymy. *H. pachydermus* is credited with half-webbed fingers. The palest specimens in our series are otherwise identical with it. *H. bayoni* has brownish thighs, and it sometimes possesses a vertebral stripe. Still, it has many other features in common with *H. pusillus*. *H. sordidus*, recently recorded from the Ituri by Boulenger (1919), has the black streaking above of our highly colored specimens but it lacks the pink spots. *H. platycephalus* agrees very well in color with one stage in our series but the species was described as having much longer legs than occur in our specimens. Finally, *H. rhodoscelis* is superficially very similar to certain of our specimens but it possesses a light dorsolateral stripe.

Variation.—The main color changes exhibited by our series have been outlined above. In life the majority of the specimens were bright yellow with pinkish spots. A number were pale gray with a dusky tinge to the canthal region. The thighs and ventral surfaces of the appendages ranged from pinkish to scarlet. One of the darkest specimens (No. 10873) was described in the field as "blackish above with curious yellowish spots each with a dark center; sides and ventral surfaces of the body yellowish; thighs, digits and under surfaces of the appendages bright pinkish; iris dark bronzy."

Habits.—Specimens taken at Vankerckhovenville in April and at Faradje in October 1912 were found in the grass bordering the swamps. Certain specimens taken at Garamba in May possessed the most highly developed sexual organs in our series, but other specimens from this same locality and taken the same time had their gonads in all stages of development. The breeding season may be irregular.

In ten stomachs which contained food there were found eighteen winged ants and the fragments of a number of other insects.

Hyperolius pleurotænius (Boulenger)

Plate XL, Figure 1

Rappia pleurotænia Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322 (type locality: Zima, Cameroon and Benito River, Spanish Guinea); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernand-Vaz, French Congo). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Ebolowa, Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 60 (Zima and Longji, Cameroon).

Thirty-one specimens: fifteen from Medje in June and six in July 1914; two from the same locality in April-May and two in July 1910; three from Gamangui, February 1910; one from Bafwasende, September 1909; one from Stanleyville in August 1913 and one in April 1915. (A. M. N. H. Nos. 9950–9980.)

Distribution.—Although *H. pleurotænius* was formerly known only from the Cameroon-Gaboon area, the American Museum expedition found it common in the Ituri. The species will probably be shown to have a wide range in the Rain Forest.

Relations.—None of our specimens agree entirely with the original description of *H. pleurotænius* for they lack the white spots above.

Nieden (1910*a*) states that these spots may be present or absent. Our specimens agree in all other details with both Boulenger's and Nieden's descriptions. They can be referable to no other species. A combination of rudimentary web between the fingers, short legs, purplish ground tone, broad dorsolateral stripe which is often edged with a very dark border and spotted with a similar tone distinguishes *H. pleurotænius* from all other forest forms of *Hyperolius*.

VARIATIONS.—Although our specimens have no well-defined white spots, the ground tone of purplish brown sometimes appears spotty, and in several of the specimens forms very distinct spots. The ground tone is sometimes very faint and the general color is yellowish instead of purplish brown. The light-colored specimens were greenish in life, the dark ones more brownish than purplish. The dorsolateral stripes were yellow and in several of the specimens, including the one photographed (Plate XL, fig. 1), vermilion spots were present on the anterior surface of the thighs.

HABITS.—A number of the specimens were taken on the forest floor. Only a few had been recently feeding, for only three stomachs of those examined contained food. This included 3 winged termites; 1 caterpillar; 1 ant; and 1 beetle.

Hyperolius nasutus Günther

Hyperolius nasutus GÜNTHER, 1864, Proc. Zoöl. Soc. London, p. 482, Pl. XXXIII, fig. 3 (type locality: Duque de Bragança).

Rappia nasuta BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 127 (Duque de Bragança, Angola). SCHILTHUIS, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 285 (Boma, Belgian Congo). GÜNTHER, 1893, Proc. Zoöl. Soc. London, p. 619 (Nyasaland). BOCAGE, 1895, 'Herpétol. Angola,' p. 169 (Angola: Duque de Bragança, Huilla and Caconda); 1896, Jorn. Sci. Lisboa, (2) IV, p. 104 (Nyasaland); 1897, (2) IV, p. 204 (Angola). BOULENGER, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 110 (Angola: Bange Ngola and Canhoca); 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169 (Uganda: Bululo and Kabulamuliro). HEWITT, 1911, Rec. Albany Mus., II, part 3, p. 224 (Marandellas, Rhodesia). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Southern Rhodesia).

Rappia puncticulata PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, p. 99 (Zanzibar). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 25 (Kibonoto, Kilimanjaro). ROUX, 1910, Rev. Suisse. Zool., XVIII, p. 102 (Jinga, Uganda. NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 375.

Rappia papyri WERNER, 1903, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1903, Pl. IV, fig. 14 (Sudan); 1912, in Brehm's 'Tierleben,' 4th Ed., IV, p. 322 (White Nile).

Forty-one specimens: thirteen from Faradje, January 1913; ten from the same locality, December 1912; six from Garamba, May 1912, and two from the same locality, March 1912; ten from Vankerckhovenville, April 1912. (A. M. N. H. Nos. 9905–9945.)

DISTRIBUTION.—*Hyperolius nasutus* is a savannah species. Its range circumscribes the forest except in the northwest. Although apparently most abundant in the savannahs lying within ten degrees of the equator, the species has been taken as far south as Southern Rhodesia.

RELATIONS.—A combination of small size, pointed snout, slender form, long hind legs and short webbing between the toes renders *H. nasutus* readily distinguishable from the other species of *Hyperolius* occurring in the Sudanese area. In *H. nasutus* the color-pattern, which is not strikingly different from that of several of the other species, is very often reduced or completely absent.

VARIATION.—Variation in *H. nasutus* is not limited to color. The tibiotarsal articulation may reach only to the middle of the eye or it may extend to nearly the end of the snout. The webbing between the fingers is often scarcely noticeable, and the webbing between the toes generally extends to only half the length of the penultimate phalanges of the third and fifth toes, and to four-fifths the length of the antepenultimate of the fourth toe.

All but four of our forty-one specimens have some indication of the white dorsolateral stripe. About half of them lack the dark stippling above. In alcohol the ground tones vary from a pale yellowish, greenish, or brownish. The series (Nos. 9936–9945) from Vankerckhovenville were described in the field as: "Ground tones varying from dark gray or brown to pale buff or greenish; dorsolateral stripes golden; ventral surfaces whitish or grayish."

HABITS.—All the specimens were taken in the vicinity of swamps. At Faradje they were found associated with *Phrynobatrachus natalensis* in the rank vegetation close to the water's edge.

Of those stomachs examined, only seven contained food. This consisted mostly of ants, of which twenty-two workers were recognizable.

Hyperolius marmoratus Rapp

Hyperolius marmoratus RAPP, 1842, Arch. Naturg., part I, p. 289, Pl. VI, figs. 1 and 2 (type locality: Natal).

Rappia marmorata BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 121 (part: Zambesi, Natal, Cape of Good Hope, Donda River, Gambia, West Africa, and Angola: Benguella, Huilla, and Ambris). SAUVAGE, 1884, Bull. Soc. Zool. France, IX, p. 201 (Majumba, French Congo). MÜLLER, 1885, Verh. Naturf. Ges. Basel, VII, p. 671 (Liberia). DOLLO, 1886, Bull. Mus. Roy. Hist. Nat.

Belgique, IV, p. 152 (region of Lake Tanganyika). SCHILTHUIS, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 285 (Boma, Belgian Congo). PFEFFER, 1893, Jahrb. Hamburg. Wiss. Anst., X, p. 94 (Mozambique: Quilimane). TRIMEN, 1893, in Noble, 'Illustrated Official Handbook of the Cape and South Africa,' p. 87 (South Africa). GÜNTHER, 1895, Ann. Mag. Nat. Hist., (6) XV, pp. 526–527 (Uganda and Nyasaland: Mandala). BOCAGE, 1896, Jorn Sci. Lisboa, (2) IV, pp. 96, 113, and 211 (Portuguese Guinea, Mozambique, and Angola: Hanha). WERNER, 1896, Jahrb. Ver. Magdeburg, p. 148 (Natal). BOULENGER, 1897, Ann. Mag. Nat. Hist., (6) XIX, p. 281 (Zambi, Belgian Congo); Proc. Zoöl. Soc. London, p. 800 (Northwest Nyasaland). JOHNSTON, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). SCLATER, 1898, Ann. S. African Mus., I, p. 108 (South Africa). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 444 (Gaboon); 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2 (Lake Moero). TORNIER, 1901, Zool. Anz., XXIV, p. 64 (Boma, Belgian Congo). BOULENGER, 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda); Proc. Zoöl. Soc. London, II, p. 15 (Mashonaland); 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 109 (Angola: seven localities); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Bolama, Portuguese Guinea and Lambaréné, French Congo); 1907, Proc. Zoöl. Soc. London, II, p. 482 (Portuguese East Africa: Beira); 1908, Ann. Mus. Stor. Nat. Genova, (3) IV, p. 6 (Sesse Islands; Victoria Nyanza). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 503 (Bipindi, Cameroon). ODHNER, 1908, Ark. Zool., Stockholm, IV, No. 18, p. 7 (South Africa: Durban and Lake Sibayi). PERACCA, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 177 (Fort Portal, East Africa). BOULENGER, 1910, Ann. S. African Mus., V, p. 530 (Salisbury, Southern Rhodesia; Delagoa Bay, Mozambique; Otjimbora, German Southwest Africa; Kentani, Port St. Johns, and Cape Peninsula, Cape Colony). LÖNNBERG, 1910, in Sjöstedt, 'Kilimandjaro-Meru Exp.,' I, part 4, p. 24, Pl. I (Kilimanjaro: Kibonoto). MEEK, 1910, Publ. Field Mus. Zoöl., VII, p. 404 (British East Africa: Athi Plains and Lukenya). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 59 (Bamenda, Cameroon); Arch. Naturg., LXXVI, part 1, p. 243, fig. 3 (Cameroon). ROUX, 1910, Rev. Suisse Zool., XIII, p. 101 (Bukoba, German East Africa: Busoga and Njarugenje, Uganda). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Anda, Lake Azingo, Gaboon). BOULENGER, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168 (Uganda: five localities). HEWITT, 1911, Ann. Transvaal Mus., III, part 1, p. 13; Rec. Albany Mus., II, pp. 210 and 223 ("West Africa, Congo, Angola, Abyssinia, East Africa and on the eastern side extending southwards as far as eastern Cape Colony"; seven localities enumerated in South Africa). PERACCA, 1912, Ann. Mus. Zool. Univ. Napoli, (2) III, No. 25, p. 7 (North Rhodesia: Luangasci and Lake Bangweolo). HEWITT AND POWER, 1913, Trans. Roy. Soc. S. Africa, III, p. 170 (Southern Rhodesia). NIEDEN, 1915, Mitt. Zool. Mus. Berlin, VII, p. 375. CHABANAUD, 1919, Bull. Mus. Hist. Nat., Paris, pp. 456–7 (Agouagon, Dahomey; Ivory Coast near Mbayakio). PROCTER, 1920, Proc. Zoöl. Soc. London, p. 417 (Basil and Nairobi, British East Africa). CHABANAUD, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 458 (N'Zerékoré, French Guinea and Samikole, Liberia).

Rappia marmorata var. *parallelus* BOETTGER, 1888, Ber. Senck. Ges., p. 96 (Vista, Ango-Ango and Lukungu, Lower and Middle Congo); 1892, 'Kat. Batr. Mus.

Senck.,' p. 20 (localities of Boettger, 1888). Bocage, 1895, 'Herpétol. Angola,' p. 164 (Chinchoxo and the Lower Congo; also Bocage's localities for var. *insignis*). Werner, 1896, Jahrb. Ver. Magdeburg, p. 148 (Natal).

Rappia marmorata var. *marginata* Bocage, 1895, 'Herpétol. Angola,' p. 164 (Duque de Bragança, Angola).

Rappia marmorata var. *tæniolata* Bocage, 1895, 'Herpétol. Angola,' p. 164 (Duque de Bragança, Huilla, Caconda, and Cohata, Angola). Ferreira, 1898, Jorn. Sci. Lisboa, (2) V, p. 241 (Caconda, Angola).

Rappia marmorata var. *huillensis* Bocage, 1895, 'Herpétol. Angola,' p. 164 (Huilla, Cahata, Quindumbo, and Bihé, Angola). Ferreira, 1898, Jorn. Sci. Lisboa, (2) V, p. 241 (Caconda, Angola).

Rappia marmorata var. *variegata* Bocage, 1895, 'Herpétol. Angola,' p. 164 (Cohata and Quindumbo, Angola).

Rappia marmorata var. *insignis* Bocage, 1895, 'Herpétol. Angola,' p. 164 (St. Salvador du Congo, Quanza, Novo Redondo, and Dombé, Angola); 1896, Jorn. Sci. Lisboa, (2) IV, p. 80 (Bolama, Portuguese Guinea). Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 160 (Cambondo and Quilombo, Angola).

One specimen from Zambi, and one from Matadi, June 1915. (A. M. N. H. Nos. 9903–9904.)

Distribution.—These two specimens, which are typical *H. parallelus* of Günther and "variety" *parallelus* of several authors, are very likely not conspecific with many of the specimens referred to in the above literature. Whether they be considered a subspecies of *H. marmoratus* or simply a color form appearing most often in our region, the statement made long ago by Boettger (1888) would apply equally well today for the distribution of this *parallelus* group of *H. marmoratus* (translation):

> This variety appearing very constantly in the Lower Congo extends along the West Coast from the Cape, from where Günther received his specimens, across Angola at least to Chinchoxo in Loango. The species itself is distributed in numerous color forms, which often have received special names, over the whole of tropical Africa from Senegal and Gambia on one side to Abyssinia on the other and appears also to dwell in one part of subtropical South Africa, in Natal and Cape Colony.

It is a significant fact that the American Museum expedition did not meet with *H. marmoratus* in the Ituri.

Relations.—Because of the undoubted variability of *H. marmoratus* and the less certain variability of many other species, many authors have referred their uncertain specimens to this species. The several specimens of *H. marmoratus* in the Museum of Comparative Zoölogy and the American Museum from regions other than the Lower Congo are so totally different in coloration from our series that it seems absurd to refer our specimens to the same species. Our specimens are undoubtedly identical with Günther's *H. parellelus* and only a large series of specimens from

South Africa can determine the identity of Günther's species with *H. marmoratus* of Rapp.

VARIATION.—Our two specimens are nearly identical in coloration, differing only in the abundance of spots on the appendages. They agree very well with Günther's figure (1858, Pl. VIII, fig. *a*). They are both sexually immature females measuring 28 and 33 mm. respectively from snout to vent.

HABITS.—Nothing is known of the conditions under which our two specimens were taken.

Only one stomach contained food. This consisted of fragments of an unidentifiable grasshopper.

Hyperolius picturatus Peters

Plate XL, Figure 3

Hyperolius picturatus PETERS, 1875, Monatsber. Akad. Wiss. Berlin, p. 206, Pl. II, fig. 2 (type locality: Victoria, Cameroon).

Rappia picturatus MATSCHIE, 1893, Mitt. Deutsch. Schutzgebieten, VI, p. 215 (Togoland). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 195 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (St. Thomas and French Congo: Fernand-Vaz and Lambaréné). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Anda, Lake Azingo, Gaboon). BOETTGER, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 349 (Pemba Island). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 10 (Medje, Belgian Congo).

Rappia marmorata BOULENGER, (?) 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 122 (part: Cameroon).

Fifty-six specimens: twenty-two from Medje in June 1914; five from the same locality in July and one in August 1914; five from the same locality in April-May 1910; seventeen from Gamangui in February 1910; two from Vankerckhovenville in April 1912; and one from each of the following localities: Garamba, May 1912; Niangara, November 1910; Bafwasende, September 1909; and Avakubi, October 1909. (A. M. N. H. Nos. 9863–9899; 9901–9902.)

DISTRIBUTION.—*H. picturatus* has very probably been confused with several other species and its recorded range may not represent its actual distribution. *H. picturatus* is primarily a Rain Forest form, but how widely it occurs beyond the forest is unknown.

RELATIONS.—Our several specimens from beyond the limits of the forest are decidedly smaller at sexual maturity than the specimens from the Rain Forest. But in color, in proportions and in all structural characters they are identical with them. The specific limits of the numerous species of *Hyperolius* are extremely variable and not well understood. It does not seem advisable to separate a species on size alone.

Boulenger (1906) has commented on the close similarity of *H. picturatus* with *H. concolor* and *H. fuscigula*. The key characters which I have used above show little variation in our series. *H. picturatus* has much in common with *H. fuscigula* and may not be distinct from it. Without a large series of specimens of all the related species, it would be impossible to determine the true status of *H. picturatus*.

VARIATION.—Our series exhibits an extraordinary uniformity in coloration. The ground tone above varies from a pale straw-color to a dark bluish-green, but the pattern is essentially the same in all the specimens. The dorsal surface is always immaculate and sharply delimitated from the ventral color by an irregular dark line which is lateral and not dorsolateral as in several other forest species.

In life *H. picturatus* was either uniform green above or green tinged with yellow laterally. The anterior and posterior surfaces of the thighs were brilliant red in all. One specimen (No. 9890), a photograph of which is reproduced on Plate XL, fig. 3, was described in life as "green above, sides yellowish, a dark streak in front of the eye continued back along the abdomen and dividing the yellowish color of the sides from the creamy tint of the ventral surface; front and rear surfaces of the thighs a bright red. Iris bronzy."

Sexually mature females from Medje, taken in June 1914, average 32 mm. (maximum, 33 mm.; minimum, 31 mm.). On the other hand, a sexually mature female from Vankerckhovenville, taken in April 1922, measures only 20 mm. from snout to vent. I have indicated above that the last specimen may not be conspecific with the others, but there is no other character but size with which to distinguish it as a race.

HABITS.—At Medje, *H. picturatus* was often found resting on the plantain leaves; at Vankerckhovenville, it was taken in the papyrus swamps. The breeding season may occur in June. At least, the sexual organs of specimens taken during that month show the greatest development.

Twelve stomachs of those examined contained food. The following assortment was recognizable: 4 flies (*Lucilia* ?); 3 worker ants; 1 roach; 1 gryllid; and fragments of membracids, beetles and numerous small leaf-hoppers.

Hyperolius phantasticus (Boulenger)

Rappia phantastica BOULENGER, 1899, Ann. Mag. Nat. Hist., (7) III, p. 274, Pl. XI, fig. 2 (type locality: Benito River, Spanish Guinea); 1900, Proc. Zoöl. Soc. London, II, p. 444 (same locality); 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernand-Vaz, French Congo). MÜLLER, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Edea, Cameroon). NIEDEN, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 61 (Edea, Cameroon). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 10 (Stanleyville, Belgian Congo).

Two specimens from Medje, April 1914. (A. N. H. N. Nos. 9981–9982.)

DISTRIBUTION.—*H. phantasticus* is a forest species, already recorded from the Upper Congo by Boulenger (1919). Our two specimens from Medje now add an Ituri locality to its range, which very probably extends widely through the forest.

RELATIONS.—Both of our specimens lack the bright colors characteristic of *H. phantasticus*, but both have the vertical loreal region and half-webbed fingers of that species. Boulenger (1899*a*) has stated the close affinity between *H. phantasticus* and *H. steindachnerii*. Although the latter species has been recorded (Boulenger, 1919) from the locality where our two specimens were taken, our specimens are certainly not referable to that species. In head-form and type of color-pattern our specimens do not agree. I have examined fifteen specimens of *H. steindachnerii* from Kribi and Ja River, Cameroon. No specimens in our collection from the Ituri have the ventral spotting of that species. In the larger of our two specimens which I have referred to *H. phantasticus*, color is present dorsally in zones as described for *H. phantasticus* and not in spots as I have observed in *H. steindachnerii*. Bright colors are often variable in batrachians. The type of color-pattern of our specimens agrees with *H. phantasticus* and there are no structural characters to distinguish these specimens from it. If not identical with *H. phantasticus*, our specimens are more closely related to it than to any other species of *Hyperolius* now described.

VARIATION.—The dorsal colors of the larger of our two specimens are not bright yellow and red, as described for *H. phantasticus*, but dull greenish yellow and purplish brown. The yellowish tone is much more extensive on the head than in the type of *H. phantasticus*. The distribution of the light and dark areas ventrally in our larger specimen is very much as described for *H. phantasticus* but the dark tone is not black but purplish brown, slightly darker than the purplish tone above. In life some black was present but the predominating tones were purplish brown on a yellowish ground.

The smaller specimen has a somewhat different coloration from the larger. The ground tone is the same dull greenish-yellow, but only a slight tinge of purple is visible on the back and tip of the snout. In life there was a slight indication of a pale dorsolateral stripe. The colors in life were much the same as in alcohol, no bright reds or yellows being present.

HABITS.—Nothing is known of the habits of *H. phantasticus.* The larger of our specimens is a sexually mature male, 27 mm. from snout to vent. It may have been breeding, for its vocal sac is greatly distended.

The stomachs of both of our specimens were empty.

Hyperolius langi, new species

Plate XXXIX, Figure 1

A single adult ♀, Niapu, January 1914. (A. M. N. H. No. 9983.)

DISTRIBUTION.—The species is known only from the type.

DIAGNOSTIC CHARACTERS.—Outer fingers one-third, toes nearly completely webbed; tibiotarsal articulation extending to half the distance between the eye and the nostril; dorsal surface very finely granular.

Reddish brown above, a yellowish canthal streak broadening out into a wide spot in the scapular region; a sprinkling of yellowish spots on the distal portions of the tibia; concealed surfaces yellowish.

TYPE.—The only specimen secured.

DESCRIPTION OF TYPE SPECIMEN.—Head broader than the body; broader than long; snout subacuminate, equal in length to the greatest diameter of the eye; the profile of the tip vertical, canthus rostralis distinct; loreal region slightly oblique, concave; nostril nearly at the end of the snout; interorbital space one and a third times the greatest diameter of the upper eyelid; tympanum hidden. Outer fingers one-third webbed (half the length of the penultimate phalanges of the two outer digits). Third and fifth toes webbed nearly to the disks, fourth toe to the base of the penultimate phalanx; tibiotarsal articulation extending midway between the eye and the end of the snout; heels well overlapping when the folded legs are held at right angles to the body; breadth of the tibia contained four and a half times in its length; tibia contained nearly two times in the head and body length; subarticular and metatarsal tubercle well-developed. Skin very finely granular above, throat smooth, belly coarsely granular, no fold across the chest.

Reddish brown above, lighter below; an indistinct stripe of pale yellow along the canthus rostralis, through the eye and widening out to a broad spot on the scapular region. Portions of the appendages, which are concealed when the legs are folded, flesh color; a few indistinct spots of yellow on the distal portions of the tibia.

In life the ground tone more brown, less red than in the preserved specimen; the light pattern yellowish and much more distinct; lower surfaces greenish, translucent, the throat lighter; iris bronzy.

MEASUREMENTS

Snout to Vent	30 mm.
Width of Head	30 "
Foreleg	19 "
Hing Leg (Vent to Tip of Longest Toe)	47 "
Tibia	16 "

RELATIONS.—*H. langi* differs from all the other species of *Hyperolius* in color-pattern. The dark ground tone with a light canthal stripe broadening out on the scapular region is not found in any other species. *H. langi* has some resemblance to *H. aylmeri*. In the key it falls nearest *H. bocagei*.

HABITS.—The stomach of our single specimen contained nothing but a single ant.

Hyperolius ocellatus Günther

Plate XXXIX, Figure 2

Hyperolius ocellatus GÜNTHER, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. VII, fig. B (type localities: Fernando Po and Angola).

Rappia ocellata BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 125 (same localities) BOCAGE, 1895, 'Herpétol. Angola.' p. 165 (same localities). BOULENGER, 1900, Proc. Zoöl. Soc. London, II, p. 444 (same localities). BOCAGE, 1903, Jorn. Sci. Lisboa, (2) VII, p. 45 (Fernando Po). ANDERSSON, 1905, Ark. Zool., Stockholm, II, No. 20, p. 17 (Cameroon). BOULENGER, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 165 (Fernando Po). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 503 (Cameroon and Fernando Po); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 60, fig. 127 (Bibundi, Cameroon). BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Bitye, Ja River, Cameroon). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 78 (Bibundi and Isongo, Cameroon).

Rappia pusilla BARBOUR, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 133 (Efulen, Cameroon). (Not of Cope 1862.)

Four specimens: one from Niapu in January; two from Medje in June and one in July 1914. (A. M. N. H. Nos. 9946–9949.)

DISTRIBUTION.—The occurrence of *H. ocellatus* in the Ituri, although not unexpected, is of interest because of the rarity of the species in collections. *H. ocellatus* is apparently a forest form and its reported occurrence in Angola requires confirmation.

RELATIONS.—At least one of our specimens is identical with a specimen (M. C. Z. 2649) from Bitye, Ja River, Cameroon, referred by Barbour (1911) to *H. ocellatus* and probably originally identified as such by Boulenger. All of our specimens are very similar to this one, and all differ from the type specimens as originally described in that they lack the white outlines to the dorsal spots, and the brown marblings to the sides of the body. Further, the fingers are more nearly half than two-thirds webbed. Nevertheless, after the variation we have seen in other species of *Hyperolius,* I do not believe that the specimens from the Ja River and the Ituri are specifically separable from the types of *H. ocellatus,* described from Fernando Po and Angola.

Variation.—In all four specimens the tibiotarsal articulation extends beyond the eye, and the fingers are at least half webbed. Coloration, also, shows little variation. The ground tone is uniformly pink, in alcohol, and the spots are black. The distribution of these spots anteriorly and their fading out posteriorly is well shown in the photograph (Plate XXXIX, fig. 2). The specimen photographed was described in life as "dull milky white with a tinge of pinkish or bluish; many round black spots on the back and forelimbs; throat chrome yellow; rest of ventral surface translucent, tinged with green; iris golden. Ground tone while under observation changing from white to bluish, and from pink to yellowish."

Habits.—Nothing is known of the habits of this species of *Hyperolius.* Only two stomachs contained food, and this was very fragmentary, consisting mostly of pieces of beetle elytra.

Hyperolius acutirostris Buchholz and Peters

Plate XL, Figure 2

Hyperolius acutirostris Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 207 (type locality: Cameroon).

Rappia acutirostris Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 154 (Cameroon). Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 194 (Cameroon). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 17 (Cameroon). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Cameroon); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 60 (Cameroon). Despax, 1911, in Cottes, 'Mission Cottes au Sud-Cameroun,' p. 242 (Gaboon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 214 (Cameroon: Bibundi and Isongo).

Rappia tuberculata Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 18 (Lower Ogowe, Gaboon); Bull. Mus. Hist. Nat., Paris, p. 55 (Lower Ogowe, Gaboon). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 444 (Ogowe River, Gaboon). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 624 (Cameroon). Boulenger, 1912, in Talbot, 'In the Shadow of the Bush,' p. 470 (Nigeria).

Thirty-three specimens: fourteen from Medje in June and eleven in July 1914; one from the same locality in May, four in July, one in August and one in September 1910; one from Bafwasende, September 1909. (A. M. N. H. Nos. 9813–9845.)

Distribution.—*H. acutirostris* was formerly known only from the Cameroon-Gaboon area and Nigeria. Our large series from the Ituri shows that the species must be equally abundant at the eastern end of the Rain Forest. Our series adds another species to the list of batrachians which range throughout the forest at least as far west as Nigeria.

RELATIONS.—Of the many species of *Hyperolius* which have been described and which I have recognized in the above table as actually distinct, only three have been described as possessing a well-developed digital web and a symmetrical pattern consisting of an interorbital bar and a more or less median pattern. In the key I have distinguished *H. acutirostris* from the other two species of this group by its longer hind limbs. In some of the specimens of *H. acutirostris* the tibiotarsal articulation reaches only to the anterior border of the eye. But the species may be distinguished from *H. symetricus* by its longer snout (longer than the eye) and from *H. undulatus* by the presence of a partial gular disk in the male. Further, the two latter species are East African while *H. acutirostris* is known only from the Rain Forest. The orange, or bright flesh-color, tinge serves as a ready means of distinguishing *H. acutirostris* from the other species in our collection. Its color-pattern is also unique in our series, but this color-pattern is not always present. A large percentage of the specimens, doubtlessly referable to *H. acutirostris*, are nearly a uniform flesh-color above and below.

There is nothing in the original description of *H. tuberculatus* to separate it from *H. acutirostris*. The range of the two species overlap and I see no reason for keeping the two species distinct.

VARIATION.—The majority of our specimens are nearly smooth. The most granular are those with the greatest development of color pattern.

The variation in color-pattern is well illustrated in a series (Nos. 9826–9836) from Medje, all taken in July 1914. In the specimen (No. 9826) with the most complete pattern the interorbital spot is in the form of a triangle directed backward; a dark area behind the shoulder is formed by the confluence of two undulating bands which form a zigzag pattern on each side of the upper surface; a dark bar across the thighs, two across the feet, one across the forearms, and another across the hands, stand out in sharp contrast to the pale reddish groundtones. The ventral surface is immaculate. The specimens in the series may be arranged to represent stages in the reduction of the pattern. In the first stage the undulating bands break up into a series of segments. Of these the most pronounced is the interorbital triangle, a spot in the scapular region, a pair of spots behind the shoulder, and a pair of spots in the sacral region. A dark area remains above each arm. The final stage is a complete loss of the dark pattern, the whole upper surface becoming flesh-color. Under the lens, contracted chromatophores may be distinguished. They give the whole dorsal surface a slightly darker tinge than the ventral surface. In some cases the pattern has not been reduced (or produced) evenly. One specimen (No. 9834), in addition to a reduced pattern, is covered above with a number of fine dark dots.

The specimens have changed but little in preservation. In life the ground tone was generally a reddish brown, although in a few it was tinged with green. The appendages, especially the webs, were suffused with pink. One specimen (No. 9825) may be taken as typical for the species. It was described as "reddish brown above, lighter on the sides; yellowish on the throat; reddish on the appendages, especially their lower surfaces; a dark spot on the crown; another behind the shoulder; another on the sacral region and several across the appendages; these dark marks not very conspicuous. Iris dark gray, nearly black."

HABITS.—Nothing is known of the habits of this species. It is inferred from an examination of the gonads of our large series that the breeding season may occur in June, at least at Medje.

Only two stomachs contained food. This consisted of the fragments of several insects.

MEGALIXALUS Günther

The comparison of the osteology of two species of this genus with that of a number of species of *Hyperolius* has not revealed any important differences. *Megalixalus* may be defined as *Hyperolius* with a vertical pupil. The twelve recognizable species of the genus may be distinguished by the following key.

- a_1.—Toes two-thirds webbed or more (not more than a single phalanx of the third and fifth digit and two phalanges of the fourth free).
  - b_1.—Tympanum distinct.
    - c_1.—Tibiotarsal articulation reaching end of snout; color above yellowish brown with dark confluent spots on appendages and posterior parts of back..*M. pantherinus.*
    - c_2.—Tibiotarsal articulation reaching eye.
      - d_1.—Fingers with short web continued as a seam to disks; brownish above thickly stippled with black...........*M. lindholmi.*
      - d_2.—Fingers nearly free, no seam.
        - e_1.—Uniform brownish above..................*M. immaculatus.*
        - e_2.—Upper parts dark violet, with round yellow spots. *M. flavomaculatus.*
  - b_2.—Tympanum hidden.
    - c_1.—Spinous warts present on dorsal surface of the body or on upper surface of snout alone.

*d*₁.—Spines restricted to snout, fingers nearly free......*M. spinifrons.*
*d*₂.—Spines most numerous posteriorly, fingers two-thirds or more webbed...*M. spinosus.*
*c*₂.—Skin smooth or slightly granular above.
*d*₁.—Three light bands extending length of back, never confluent; adult females not over 30 mm. in length..........*M. leptosomus.*
*d*₂.—Two light bands on back confluent or broken in sacral region; adult females over 30 mm. in length..............*M. fornasinii.*
*d*₃.—Pale brown above, with a faintly marked band, commencing on snout and progressively widening on the back....*M. loveridgii.*
*a*₂.—Toes less than two-thirds webbed.
*b*₁.—Digital disks small.................................*M. gramineus.*
*b*₂.—Digital disks large.
*c*₁.—Grayish above with two brown lines along back.......*M. brachycnemis.*
*c*₂.—Grayish above stippled with red, four longitudinal brown lines converging on head.................................*M. vittiger.*

Megalixalus spinosus (Buchholz and Peters)

Plate XLI, Figure 2

Hyperolius spinosus BUCHHOLZ AND PETERS, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 208, Pl. I, fig. 3 (type locality: Cameroon).

Megalixalus spinosus BOULENGER, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130 (Cameroon). WERNER, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 196 (Cameroon). BOULENGER, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 64 (Cape St. John, Spanish Guinea). NIEDEN, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Fernando Po and Cameroon: Victoria and Bipindi); 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 58, fig. 124 (Cameroon: Victoria and Johann-Albrechtsthöhe). LAMPE, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 215 (Bibundi, Cameroon). BOULENGER, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 10 (Medje, Belgian Congo).

Two specimens, ♂ and ♀, from Medje, June 1914. (A. M. N. H. Nos. 9400–9401.)

DISTRIBUTION.—Boulenger (1919) has already remarked upon the occurrence of this typical Cameroon form in the Ituri. The singular form of *M. spinosus* would lead us to expect that the species was confined to the forest.

RELATIONS.—In spite of its extraordinarily produced head, extended webs, and roughened skin, *M. spinosus* shows close affinity to other species of *Megalixalus* in its internal structure. The omosternum is not so widely forked as in *M. fornasinii,* and the claw-shaped terminal phalanges are decidedly more blunt at the tips, but on the whole the species is internally a typical *Megalixalus.*

VARIATION.—It is only the male of our two specimens which has along the ventral surface of the tarsus the enlarged horny spines commented upon by several authors. I strongly suspect these tarsal spurs are characteristic of only the male sex. Both of our specimens are sexually mature, apparently breeding, and yet, oddly enough, the male is a little larger than the female, being 38.5 mm. (from snout to vent) as against 37 mm.

Another feature which I take to be a secondary sexual character of the male is a pair of gular glands, one below each angle of the jaw. These are ovoid in shape, 3×5 mm. in size, of the same color as the throat, and without any indication of excrescencies. They deserve histological comparison with the brachial glands of *Leptopelis rufus* and *L. aubryi.*

The female specimen is grayer than the male and more heavily marbled with black; the dorsal spines are less prominent and are not disinctively colored as in the male (in alcohol). The latter was described in the field as "translucent green above, with many rounded protuberances often of a lighter shade; dark gray on the snout; a blackish interorbital bar of triangular form, the point directed posteriorly; a blackish triangular mark in the shoulder region pointing forward; a large dark blotch in the sacral region; all these dark markings more or less connected by a fine reticulation of same color; sides of the body grayish clouded with a darker tone; ventral surface whitish, heavily marbled with gray."

Habits.—Both specimens were taken by natives, the male between the stones bordering a forest brook. The female contained in her ovaries a small number of very large eggs (over 3 mm. in diameter). They were pigmented at one pole. Future field work will probably reveal that *M. spinosus* has a peculiar life history. Nearly all frogs with large eggs have an abbreviated larval life, but in all the other cases of heavily yolked eggs, with which I am familiar, the eggs in the ovarium are unpigmented

Both stomachs contained a small amount of food. This consisted of the fragments of several insects and a syrphid fly larva (*Eristalis*).

Megalixalus leptosomus (Peters)

Hyperolius leptosomus Peters, 1877, Monatsber. Akad. Wiss. Berlin, p. 619, fig. 5 (type locality: Chinchoxo, Portuguese Congo).

Megalixalus leptosomus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 129 (same locality). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 157 (Island of Zanzibar and German East Africa: Tanga and Undussuma). Mocquard, 1897, Bull. Soc. Philom. Paris, (8) IX, p. 19 (Gaboon: Lambaréné). Tornier, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). Vaillant, 1904, Bull. Mus. Hist. Nat., Paris, X, p. 436 (Senegal: Douma). Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 362 (Usambara). Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, pp. 456–7 (Agouagon, Dahomey). Chabanaud, 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 459 (French Guinea and Liberia; several localities).

Megalixalus stuhlmannii Pfeffer, 1893 (for 1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 99 (Zanzibar).

Megalixalus leptosomus quadrivittatus Werner, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, part 1, p. 1900 (Sudan: Khor Attar).

Megalixalus vittiger Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Bitye, Cameroon). (Not of Peters.)

Megalixalus fornasinii Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 372 (part: German East Africa). (Not of Bianconi.)

Nine specimens: three from Faradje, December 1911, one September and one December 1912; one from Stanleyville, August 1909; one from Garamba, March 1911; one from Vankerckhovenville, April 1912; and one from Medje, July 1914. (A. M. N. H. Nos. 9402–9410.)

Distribution.—The range of *M. leptosomus* presents an anomaly. While it is highly probable that the species has been confused with *M. fornasinii,* this confusion would not account for the almost undoubted occurrence of the species in two such dissimilar habitats as the Gaboon and Sudan areas. Our specimens were taken in such scattered localities in both the Rain Forest and Sudanese savannahs that it is apparent that factors other than hydrographic and vegetational ones govern the distribution of the species.

Relations.—The literature cited in the above synonymy does not include all the references to *M. leptosomus,* but only those which I am able to judge actually apply to that species. *M. leptosomus* has been confused with *M. fornasinii* by many authors. Nieden (1915), after reviewing the discussion, concludes that the two species are identical. I agree with Nieden that the characters formerly used for separating the two species are of little or no value, but I cannot admit that our series of *M. leptosomus* shows any intergradation to the distinctly larger and very differently colored *M. fornasinii.* The two sexually mature males in our series measure from snout to vent 22.5 mm. (No. 9404) and 25 mm. (No. 9402), respectively; the three adult females, 28 mm. (No. 9405), 25 mm. (No. 9408), and 26 mm. (No. 9409), respectively. As I have indicated in the key, these specimens differ decidedly from *M. fornasinii* in color-pattern.

I feel certain that our specimens are identical with Werner's *M. l. quadrivittatus* from farther north in the Sudan. There is nothing in Peters' original description or figure of *M. leptosomus* to distinguish our specimens from the type of that species. Werner compares his race with East African specimens, but it appears from his remarks that these specimens were actually referable to *M. fornasinii* and not to *M. leptosomus*.

Variation.—One of the characters used by Boulenger (1882) and others to distinguish the two species was the presence or absence of tubercles on the dorsal surface. It has been pointed out by Werner (1898) and Nieden (1915) that *M. fornasinii* shows considerable variation in this respect. In *M. leptosomus* I find that it is only the female and immature specimens which are smooth above; sexually mature males are covered dorsally with extremely fine but sharply pointed tubercles. A large series would probably show some variation in this respect (e.g., as in *Chiromantis*) but for the present we may consider these tubercles characteristic in *M. leptosomus* of only the breeding male.

Our series shows little variation in color and I have employed pattern as a distinguishing character of this species as of many species of the related genus *Hyperolius*. As Werner (1907) has pointed out, the light stripes are not silvery in life but are reddish brown; the dark stripes, a dark reddish or purplish.

Habits.—The majority of our specimens were taken in the vicinity of papyrus swamps. Werner (1907) found his specimens under similar conditions. The specimen (No. 9405) taken at Stanleyville was found on the forest floor. The three specimens (Nos. 9408–9410) taken at Faradje in February 1911 "were found sitting in the hollow trunk of a rotten papaw tree which was lying on the ground."

Vaillant (1904) has reported that McClaud found in February at Douma, Casamance (Senegal), in the internode of a green bamboo about thirty estivating frogs of this species. The specimens taken at Faradje during the same month were apparently not estivating but simply passing the day in hiding.

Only two stomachs contained food, and in these stomachs only 2 spiders and 1 hemipteron were recognizable.

Megalixalus fornasinii (Bianconi)

Plate XLI, Figure 1

Euchnemis fornasinii Bianconi, 1850, 'Spec. Zool. Mosamb., Rept.,' fasc. 2, p. 23, Pl. v, fig. 1 (type locality: Mozambique).

Megalixalus fornasinii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130 (Mozambique, Shiré Valley, Zanzibar, and Lake Nyasa). Peters, 1882, 'Reise nach Mossambique,' III, p. 160, Pl. xxiv, fig. 2, Pl. xxvi, fig. 6 (Boror and Inhambane, Mozambique). Pfeffer, 1889, Jahrb. Hamburg. Wiss. Anst., VI, part 2, p. 10 (German East Africa: Mhonda and Kingani). Boulenger, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 93 (Ugogo, German East Africa). Müller, 1890, Verh.

Naturf. Ges. Basel, VIII, p. 257 (Zanzibar). Boulenger, 1891, Proc. Zoöl. Soc. London, p. 308 (Shiré Valley and Lake Nyasa). Boettger, 1892, 'Kat. Batr, Mus. Senck.,' p. 21 (Mozambique). Pfeffer, 1893, Jahrb. Hamburg. Wiss. Anst., X, p. 99 (German East Africa: Kingani, Mhonda, and Ungúu). Günther, 1894, Proc. Zoöl. Soc. London, p. 88 (British East Africa: Ngatana). Bocage, 1896, Jorn. Sci. Lisboa, (2) IV, p. 101 (Mozambique). Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 156 (Zanzibar and German East Africa: Tanga, Dar-es-Salaam, and certain localities given above). Günther, 1897, Proc. Zoöl. Soc. London, p. 801 (Nyasaland). Johnston, 1897, 'British Central Africa,' 1st Ed., p. 361*a* (Nyasaland). Tornier, 1897, Arch. Naturg., LXIII, part 1, p. 66 (German East Africa). Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 195 (Cameroon). Mocquard, 1899, Bull. Mus. Hist. Nat., Paris, V, p. 219 (Zambezi). Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 445 ("Gold Coast to Congo, Nyasaland, East Africa from the Zanzibar Coast to Delagoa Bay"). Nickel, 1901, Helios, XVIII, p. 72 (German East Africa). Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 18 (Cameroon). Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 166 (Fernando Po; Cameroon: Buea; and French Congo: Fernand Vaz and Lambaréné). Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 238, figs. 1–3 (Bibundi, Cameroon). Mocquard, 1908, in Foà, 'Résult. Sci. Voyages en Afrique d'Edouard Foà,' p. 558 (Plain of the Zambezi). Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 504 (Fernando Po and Cameroon: Victoria and Bipindi). Boulenger, 1910, Ann. S. African Mus., V, p. 531 (Tropical Africa and Portuguese East Africa). Lönnberg, 1910, in Sjöstedt, 'Kilimandjara-Meru Exp.,' I, part 4, p. 25 (Mombo, German East Africa). Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625 (Edea Cameroon). Nieden, 1910, 'Fauna Deutschen Kol.,' (1) Heft 2, p. 58, figs. 121–123 (Cameroon: Bibundi, Victoria, and Bipindi). Barbour, 1911, Bull. Mus. Comp. Zoöl., Cambridge, LIV, No. 2, p. 134 (Lake Asebbe, Gaboon, and Efulen, Cameroon). Lampe, 1911, Jahrb. Nassau. Ver. Naturk., LXIV, p. 215 (Cameroon: Bibundi, Isongo, and Mowange). Hewitt, 1911, Rec. Albany Mus., II, p. 224 (Distribution of Boulenger, 1900). Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika.,' III, pp. 346 (Zanzibar). Hewitt, 1913, Ann. Natal Mus., II, p. 479 (part: Marianhill, Natal). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 372 (part: German East Africa). Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 457 (Dahomey); 1921, Bull. Com. Et. Hist. et Sci. A. O. F., p. 459 (French Guinea and Liberia: several localities).

Megalixalus schneideri Boettger, 1889, Ber. Senck. Ges., p. 276 (Bonamandune, Cameroon).

Megalixalus fornasinii var. *unicolor* Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 349 (Pemba).

Megalixalus fomasinii Boulenger, 1902, in Johnston, 'Uganda Protectorate,' I, p. 447 (Uganda). (Misspelling.)

Forty specimens: twenty-four from Bafwasende, September 23, 1909; nine from Medje in June and five in July 1914; two from Gamangui, February 1910. (A. M. N. H. Nos. 9411–9450.)

Distribution.—The range of *M. fornasinii* is not limited by the Rain Forest as our locality records would imply. The species appears equally abundant in East Africa from Pemba Island and Ngatana south to Marianhill. This distribution is exceptional and probably dependent on causes other than those affecting the distribution of the majority of African batrachians.

RELATIONS.—Hewitt (1913) has considered *M. spinifrons* identical with this species. In another paper (Hewitt, 1912, p. 280) he has discussed the status of the two species more fully. Hewitt's arguments fail to be convincing when based on the spinosity of the two species for, as pointed out below, the presence or absence of spines is a sexual not a specific character of *M. fornasinii.* A single specimen of *M. spinifrons* from Marianhill, Natal, received in exchange from the Durban Museum, shows only a trace of the dorsal striping. It is a female, 20 mm. in length, with ova half developed. It has very prominent spines on the head and scapular regions. Our series of *M. fornasinii* shows that in this species the spines are characteristic of only certain adult males. The presence of these spines in the female, the variable coloration, and perhaps the smaller size distinguish *M. spinifrons* from *M. fornasinii.*

M. fornasinii shows so much uniformity in coloration throughout its range that I have used its color-pattern as a key character. The only exception to this uniformity has been reported by Boettger (1913) from Pemba Island. I have referred his "variety" *unicolor* doubtfully to *M. fornasinii.* Specimens from that region require comparison with West African specimens before any further statement may be made.

Andersson (1907) has shown the range of color-pattern variation in *M. fornasinii.* His extreme dark specimen (Plate XLI, fig. 1) so nearly approaches the description of *M. schneideri* that I have not hesitated in referring the latter to the synonymy of *M. fornasinii. M. schneideri* was known only from the type, although Cameroon is herpetologically well known.

VARIATION.—Our series does not show as much variation in color-pattern as the series described by Andersson. In life the pale dorsal stripes were generally whitish or brownish gray. In a number of specimens taken 10 o'clock in the morning, September 23, 1909, at Bafwasende, the pale stripes were golden or of a light bronzy tone.

Spines are present on the dorsal surface of nearly all of the adult males in our series. A few of the adult males do not have any indication of them. All seven of our adult females are perfectly smooth above. This would seem to indicate that in *M. fornasinii*, as in many other African frogs, spinosity is a variable feature but one peculiar to the adult male.

Two specimens (Nos. 9447–9448) from Medje, June 1914, are of especial interest. The first is 15 mm. from snout to vent and still possesses a larval tail 8 mm. long. The second is 16.5 mm. in head and body length and has a tail 5 mm. long. These two specimens are identical in coloration with the adults and show no tendency toward the complete stripes of *M. leptosomus.* In this distinctive coloration, and in their large size at metamorphosis the young of *M. fornasinii* are sharply differentiated from the young of *M. leptosomus.*

There is a distinct difference in the size of the sexes of *M. fornasinii.* Our series of seven adult females average 34.9 mm. (maximum, 37 mm.; minimum, 33 mm.); while our series of thirty-one adult males average 29.8 mm. (maximum, 32 mm.; minimum, 27 mm.).

HABITS.—Nothing is known of the breeding season of this species. Females with greatly distended ova were taken at Bafwasende in September. Here they were found common in the immediate vicinity of the station.

Three of the stomachs examined contained food. The only distinguishable forms in these stomachs were 2 roaches.

Brevicipitidæ

Five genera of brevicipitids lacking the maxillary teeth and two possessing them have been described from Africa. The relationships of these seven genera are not very clear. This may be due to the fact that the family as a whole is a derived one (see Noble, 1922), the African genera having had a polyphyletic origin. Every indication points to their having evolved from a comparatively ancient stock, the same that found access to Madagascar and gave rise to no less than thirteen genera, four of which have lost the maxillary teeth. We have postulated an early migration of a toothed brevicipitid stock into Africa and a subsequent introduction into Madagascar. This migration may have occurred more than once, since the assemblage of genera at present in Africa does not form a natural group.

Callulina is apparently most closely related to the recently described *Aphantophryne* of New Guinea. Nieden's original description of the former genus is very brief and Fry (1916, p. 770) in his admirable paper on the latter overlooked the former genus entirely.

Hemisus and *Breviceps* are so specialized that little may be said as to their nearest relatives. Their extraordinary modification leads one to suspect that they may be representatives of the oldest batrachian fauna of Africa.

Didynamipus does not seem closely related to any brevicipitid. It appears externally very much like a bufonid. Boulenger (1906, p. 159) apparently had a specimen of *Didynamipus sjöstedti* before him when he described *Atelophryne minuta* and referred it to the Bufonidæ. I take these two species to be identical and Boulenger's *Atelophryne* synonymous with *Didynamipus*. Boulenger does not state that he has examined the internal structure of his material.

Phrynomantis is one of the few genera of African batrachians which is not confined to the continent. Still, *P. fusca*, the single exotic species of *Phrynomantis*, may not be congeneric with the African forms. It was described long ago from the islands of Amboyna and Batanta in the East Indies and is today very unsatisfactorily known. Peters and Doria (1878, p. 420) have pointed out some differences between the coracoid of *P. fusca* and *P. bifasciata*. Further, *P. fusca* does not possess a metatarsal tubercle and has different digital proportions from the African species. Less difficulty is experienced in assuming that *P. fusca* is a case of convergent evolution than in assuming land-bridges or former wide dispersals to account for the present distribution of the species grouped under *Phrynomantis*.[1]

Cacosternum seems to be most closely related to recently described *Anhydrophryne*, which in its scarcely dilated sacral diapophyses is more primitive than any known brevicipitid. Hewitt (1919, p. 186) would apparently derive the toothless *Phrynomantis* as well from *Anhydrophryne* or from a closely related stock, but he proceeds very cautiously: "From the above-mentioned facts it will be understood that the supposed relationship between *Phrynomantis*, *Cacosternum*, and *Anhydrophryne* is an inference based solely on the characters of the pectoral girdle, due allowance being made for the fact that these three genera are South African, the two latter being peculiar to the continent." The relationships of these brevicipitids have been discussed in greater detail in my earlier paper (Noble, 1922). It seems highly probable that they have all evolved from a primitive stock. *Cacosternum* and *Anhydrophryne* have little in common with any exotic genera. Nevertheless, they possess a few features in common with *Anodonthyla* of Madagascar and *Calliglutus* of Borneo.

Hemisus Günther

This genus is the only brevicipitid represented in the collection. It embraces two closely related species which may be distinguished as follows.

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[1] Van Kampen (1923, 'The Amphibia of the Indo-Australian Archipelago') has doubtfully referred *P. fusca* to *Oreophryne celebensis*.

a_1.—Inner metatarsal tubercle not longer than free part of inner toe. . . . *H. guttatum.*
a_2.—Inner metatarsal tubercle longer, generally much longer than free part of inner toe. . . . . *H. marmoratum.*

Hemisus marmoratum (Peters)

Plate XLII; Text Figures 7 and 8

Engystoma marmoratum Peters, 1855, Arch. Naturg., part 1, p. 58 (type locality, Cabaçeira, Portuguese East Africa).

Hemisus marmoratus Peters, 1882, 'Reise nach Mossambique,' p. 173, Pl. xxv, fig. 1; Pl. xxvi, figs. 10*a*, 10*b*, and 10*c* (Portuguese East Africa: Cabaçeira and Boror).

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Ninety-six specimens: ninety-two of these from Niangara, June 1913; one from Faradje, July 1911; one, October and another, November 1912, from the same place; and one from Zambi, June 1915. (A. M. N. H. Nos. 8875–8970.)

Distribution.—Although Boulenger (1910*a*) has given the range of the species as "tropical Africa southwards to Angola, Mashonaland, and Beira," an examination of the locality records will show that this statement does not include its actual distribution. *H. marmoratum* occurs in the savannahs both to the north and to the south of the Rain Forest. It has a wide range in the open country of East Africa. It has been taken as far south as Southern Rhodesia, and as far west as Kouroussa by Mocquard (1902*a*), so that the distribution of the species as a whole shows that it is a typical wide-ranging savannah form.

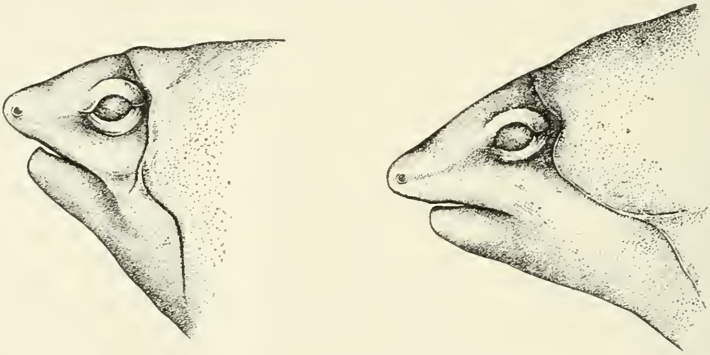

Fig. 7. *Hemisus marmoratum* (Peters). Lateral aspect of head to show individual variation in length of the snout.

Relations.—Various investigators have pointed out that Steindachner's figure (1863, Pl. i, figs. 10–12) of *H. sudanense* represent a much longer snouted species than the typical *H. marmoratum*. Bocage (1895, p. 184) and Nieden (1912, p. 183) have indicated that the species should be considered distinct. Nevertheless, Boulenger (1910) has referred *H. sudanense* to *H. marmoratum* without discussion and has later (1910*a*) included it in the synonymy of the latter species. In this he has recently been followed by Hewitt (1913). Our ninety-two specimens taken during June at Niangara show such an extraordinary range of variation that there can be no doubt that Boulenger was correct in his disposition of *H. sudanense.* The snout, foot, and tibia vary greatly in length, while two of the specimens have the inner metatarsal tubercle only slightly more pronounced than that of *H. guttatum.* Only one specimen of the latter species is available for study. This has the distance between the eye and the tip of the snout distinctly shorter than the distance between the anterior corners of the eyes. Still, it may be distinguished from *H. marmoratum* by its very small "shovel." Since the subarticular tubercles are often absent in the latter species, I cannot agree with Boulenger (1910) in considering their absence diagnostic of *H. guttatum.* In brief, it is apparent that the genus *Hemisus* is represented by but two closely related forms.

VARIATION.—As in many other species of frogs, the snout does not show a constant form. Its length does not always vary in proportion to its width. In our series the distance between the eyes is generally four-fifths the distance between the eye and the end of the snout. In a few of our specimens the distance between the first two of these points is equal to the distance between the latter two, while in others it is but three-fourths that distance.

The length of the tibia is another variable feature. In males and females of 32 mm. in length (head and body) the tibia is contained in the distance between snout and vent two and one-half times. In gravid females it is contained three times or more. This is a great range of difference, but one apparently due to the fact that as the body of the female increases in size, to accommodate the eggs, the posterior appendages do not lengthen in proportion. In individuals of the same size there is a certain degree of variation, difficult to measure because of the small size of the elements.

Specimens having the longest tibia were found to have the longest feet. The difference between the extremes, generally less than a millimeter, may be seen in Figure 8 of a foot from each of two males of identical size, 33 mm., taken at Niangara in June 1913. The "shovel" is least developed in one individual (No. 8935) which has apparently not been digging for some time since the ends of the digits were fleshy, not callous as in most specimens. The "shovel" was not well developed in another specimen which had the right forelimb amputated at the wrist and the left hind limb at the knee, both wounds completely healed. This specimen, a male, 33 mm. long, has probably not been able to do much digging with its one remaining "shovel."

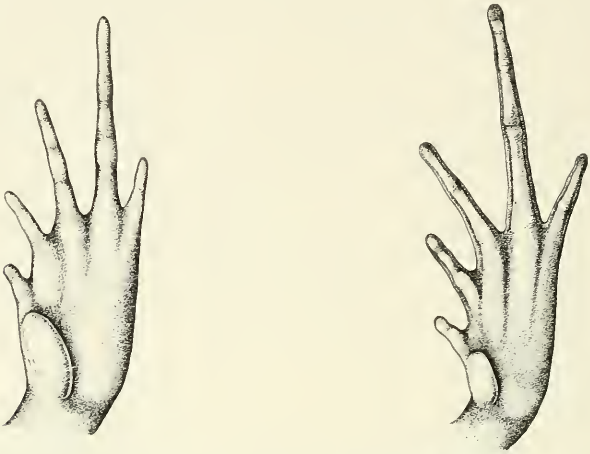

Fig. 8. *Hemisus marmoratum* (Peters). Ventral aspect of left feet to show individual variation in development of "shovel" and length of digits.

Sexually mature males average 32mm. in length (maximum, 34 mm.; minimum, 31 mm.). Gravid females average 47 mm. (maximum, 50 mm.; minimum, 45 mm.). Breeding males have a broad glandular surface covering the upper surfaces of the wrist and three inner fingers. No black asperities are visible on these surfaces. Adult males have a much darker throat than females of the same size. A few of the adult females have a throat which approaches that of the adult male in color.

The coloration of most of our specimens does not agree with that generally given for the species. The majority are dark reddish-brown above, spotted with yellow on the sides of the body and on the upper surfaces of the appendages. Some of the specimens lack the spots entirely and are grayer, less reddish than the others. All of the specimens except one have the ventral surface exclusive of the gular region immaculate. This one (No. 8935) has the ventral surface chocolate-brown spotted with pale yellow. It is interesting that this peculiar coloration should be correlated with a small "shovel" and elongate tibia and foot with the ends of the digits devoid of callouses.

In life the ground-tone above was "dark brown, spotted with yellow on the sides; ventral surface pinkish, translucent. Iris a dark bronzy tone."

HABITS.—Tornier (1896), Werner (1907), and Bles (1907) have briefly commented on the habits of *H. marmoratum.* The American Museum expedition was able to confirm the statement of earlier workers that the species lives mostly underground, chiefly in the nests of termites. I quote directly from Mr. Lang's field notes:

"After heavy rains great numbers of this species came out of their burrows, and were then easily caught. Only three were found under other circumstances: one in a papyrus swamp; another on a small heap of fresh earth where an elephant had been recently digging; and the third about one inch below the surface of rather firm ground underlying a fallen log.

"One specimen was kept in a tin box with soft moist sand. When disturbed by lifting of the cover, the creature would burrow rapidly out of sight. In the process of the digging, it not only used its hind limbs, but after a start had been made, it would use its snout for pushing the soil upward over its back."

The degree of development of the ovaries in our huge series of specimens from Niangara suggests that the breeding season of *H. marmoratum* may occur in the Uele District about the same time as Budgett found it to take place in Gambia, namely, about the second week in July. Still, such a large proportion of the females are immature that it seems very probable that two years or more are required for them to reach sexual maturity.

H. marmoratum has been often termed an "ant-eater." The following summary of the stomach contents of twenty-two specimens indicates that the name is an appropriate one: over 910 soldier and worker termites; 55 minute, blind, driver ants and 41 worker ants.

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A CHECK LIST OF THE AMPHIBIA OF AFRICA

CAUDATA

Oppel, 1811, 'Ordn. Rept.,' p. 72

Salamandridæ

PLEURODELES

Michahelles, 1830, Isis, p. 195

Type: *waltl*

Pleurodeles waltl Michahelles

Pleurodeles waltl Michahelles, 1830, Isis, p. 195.
Molge waltlii Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 27.
Type Locality: Southern Spain.
Range: Spain and Portugal; Morocco eastward to Tunisia, and south of the Sahara at Diéké, French Guinea.

TRITURUS

Rafinesque, 1815, 'Analyse de la Nature' (Palermo), p. 78

Type: *cristatus*[1]

Triturus hagenmulleri (Lataste)

Glossoliga hagenmulleri Lataste, 1881, Le Naturaliste, I, p. 371.
Molge hagenmuelleri Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 26.
Type Locality: Bona, Algeria.
Range: Algeria.

Triturus poireti (Gervais)

Triton poireti Gervais, 1835, Bull. Soc. Sci. Nat., p. 113.
Molge poireti Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 25.
Type Locality: Barbary.[2]
Range: Algeria.

SALAMANDRA

Laurenti, 1768, 'Syn. Rept.,' p. 41

Type: *salamandra*

Salamandra salamandra (Linnæus)

Lacerta salamandra Linnæus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 204.
Salamandra maculosa Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 3.
Type Locality: Europe.
Range: Barbary; central and southern Europe to Syria.

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[1] *Triturus* is a substitute name for *Triton* Laurenti, preoccupied. The name *Triturus* was proposed several times by Rafinesque, at least twice before the name *Molge* of Merrem. The type *cristatus* seems to be the earliest designated type of *Triturus*.

[2] This locality has not been verified from the original description. Only a subsequent description is available to me (1836, Ann. Sci. Nat., VII, p. 313).

GYMNOPHIONA

J. Müller, 1832, Zeitsch. Phys., p. 206

Cæciliidæ

BDELLOPHIS

Boulenger, 1895, Proc. Zoöl. Soc. London, p. 412
TYPE: *vittatus*

Bdellophis unicolor Boettger

Bdellophis unicolor Boettger, 1913, in Voeltzkow, 'Reise in Ostafrika,' III, p. 353, Pl. XXIII, fig. 18.

TYPE LOCALITY: Peccetoni, Kenya Colony.

RANGE: Known only from the type locality.

Bdellophis vittatus Boulenger

Bdellophis vittatus Boulenger, 1895, Proc. Zoöl. Soc. London, p. 412, Pl. XXIV, fig. 4. Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 389.

TYPE LOCALITY: Usambara, Tanganyika Territory.

RANGE: Tanganyika Territory.

BOULENGERULA

Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 164
TYPE: *boulengeri*

Boulengerula boulengeri Tornier

Boulengerula boulengeri Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 164. Nieden, 1913, 'Das Tierreich; Gymnophiona,' p. 27, fig. 19.

TYPE LOCALITY: Usambara, Tanganyika Territory.

RANGE: Usambara, Tanganyika Territory.

Boulengerula denhardti Nieden

Boulengerula denhardti Nieden, 1912, Sitzber. Ges. Naturf. Freunde Berlin, p. 199.

TYPE LOCALITY: Tana region, Kenya Colony.

RANGE: Known only from the type locality.

DERMOPHIS

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 937
TYPE: *mexicanus*

Dermophis gregorii Boulenger

Dermophis gregorii Boulenger, 1894, Proc. Zoöl. Soc. London, p. 646, Pl. XL, fig. 4.

TYPE LOCALITY: Ngatana, Kenya Colony.

RANGE: Known only from the type locality.

Dermophis thomensis (Bocage)

Siphonops thomensis Bocage, 1873, Jorn. Sci. Lisboa, IV, p. 224.

Dermophis thomensis Boulenger, 1894, Proc. Zoöl. Soc. London, p. 646, Pl. XL, fig. 5.

TYPE LOCALITY: St. Thomas.

RANGE: St. Thomas and Rolas Islands, Gulf of Guinea.

GEOTRYPETES

Peters, 1880, Sitzber. Ges. Naturf. Freunde Berlin, p. 55
TYPE: *seraphini* (=*petersii*)

Geotrypetes petersii Boulenger

Geotrypetes petersii Boulenger, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 329. Nieden, 1913, 'Das Tierreich; Gymnophiona,' p. 15, fig. 14.

TYPE LOCALITY: "West Africa."

RANGE: Gaboon to Togo.

HERPELE

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 939
TYPE: *squalostoma*

Herpele bornmuelleri Werner

Herpele bornmuelleri Werner, 1899, Verh. Zool.-Bot. Ges. Wien, XLIX, p. 144.

TYPE LOCALITY: Victoria, Cameroon.

RANGE: Known only from the type locality.

Herpele multiplicata Nieden

Herpele multiplicata Nieden, 1912, Sitzber. Ges. Naturf. Freunde Berlin, p. 210.

TYPE LOCALITY: Mundame, Cameroon.

RANGE: Known only from the type locality.

Herpele squalostoma (Stutchbury)

Cæcilia squalostoma Stutchbury, 1834, Trans. Linn. Soc. London, XVII, p. 362.

Herpele squalostoma Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 939, Pl., fig. 8.

TYPE LOCALITY: Gaboon.

RANGE: Cameroon-Gaboon area including Fernando Po.

HYPOGEOPHIS

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 936
TYPE: *rostratus*

Hypogeophis guentheri Boulenger

Hypogeophis guentheri Boulenger, 1882, 'Cat. Batr. Grad. Brit. Mus.,' p. 96, Pl. VII, fig. 1.

TYPE LOCALITY: Zanzibar.

RANGE: Known only from the type locality.

SCOLECOMORPHUS

Boulenger, 1883, Ann. Mag. Nat. Hist., (5) XI, p. 48
TYPE: *kirkii*

Scolecomorphus kirkii Boulenger

Scolecomorphus kirkii Boulenger, 1883, Ann. Mag. Nat. Hist., (5) XI, p. 48. Nieden, 1913, 'Das Tierreich; Gymnophiona,' p. 28, fig. 20.

TYPE LOCALITY: "Probably vicinity of Lake Tanganyika."

RANGE: Nyasaland.

URÆOTYPHLUS

Peters, 1879, Monatsber. Akad. Wiss. Berlin, p. 933
TYPE: *oxyurus*

Uræotyphlus seraphini (A. Duméril)

Cœcilia seraphini A. Duméril, 1859, Arch. Mus. Hist. Nat. Paris, X, p. 222.

Uræotyphlus seraphini Boulenger, 1895, Ann. Mag. Nat. Hist., (6) XV, p. 328.

TYPE LOCALITY: Gaboon.

RANGE: French Guinea south to Gaboon.

SALIENTIA

Laurenti, 1768, 'Syn. Rept.,' p. 24

Pipidæ

HYMENOCHIRUS

Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 420
TYPE: *boettgeri*

Hymenochirus boettgeri (Tornier)

Xenopus boettgeri, Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 163, fig. L.

Hymenochirus boettgeri Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 420; 1899, (7) IV, p. 122.

TYPE LOCALITY: "Wandesoma," Ituri Forest, Belgian Congo.

RANGE: Cameroon and Gaboon, eastward to the limits of the Ituri Forest.

Hymenochirus curtipes Noble

Hymenochirus curtipes Noble, see above, p. 155, Pl. XXIII.

TYPE LOCALITY: Zambi, Lower Congo.

RANGE: Known only from the type locality.

Hymenochirus feæ Boulenger

Hymenochirus feæ Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158, Pl. I, fig. 1.

TYPE LOCALITY: Fernand-Vaz, French Congo.

RANGE: Known only from the type locality.

PSEUDHYMENOCHIRUS

Chabanaud, 1920, Bull. Et. Hist. et Scient. A.O.F., p. 494
TYPE: *merlini*

Pseudhymenochirus merlini Chabanaud

Pseudhymenochirus merlini Chabanaud, 1920, Bull. Et. Hist. et Scient. A.O.F., p. 494; 1921, *op. cit.*, p. 448, Pl. I.

Type Locality: Dixine (near Conakry) French Guinea.

Range: Known only from the type locality.

XENOPUS

Wagler, 1827, Isis, p. 726
Type: *boiei* = *lævis*

Xenopus clivii Peracca

Xenopus clivii Peracca, 1898, Boll. Mus. Torino, XIII, No. 321, p. 3.

Type Locality: Eritrea.

Range: Eritrea and Abyssinia.[1]

Xenopus lævis (Daudin)

Bufo lævis Daudin, 1803, 'Hist. Nat. des Rainettes,' p. 85, Pl. xxx, fig. 1.

Xenopus lævis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 456.

Type Locality: Unknown.

Range: South Africa, northward to Angola on the west, and probably Kilimandjaro on the east.

Xenopus muelleri (Peters)

Dactylethra muelleri Peters, 1844, Monatsber. Akad. Wiss. Berlin, p. 37.

Xenopus muelleri Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 457 (part).

Type Locality: Mozambique.

Range: The Sudan and East Africa.

Xenopus tropicalis (Gray)

Silurana tropicalis Gray, 1864, Ann. Mag. Nat. Hist., (3) XIV, p. 316.

Xenopus calcaratus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 458.

Xenopus tropicalis Müller, 1910, Abh. Bayer. Akad. Wiss., 2 Kl., XXIV, p. 625.

Type Locality: Lagos, West Africa.

Range: The Rain Forest.

Discoglossidæ

DISCOGLOSSUS

Otth, 1837, Neue Denkschr. Allgem. Schweiz. Naturf. Ges., I, p. 6, figs. 1–8
Type: *pictus*

Discoglossus pictus Otth

Discoglossus pictus Otth, 1837, Neue Denkschr. Allgem. Schweiz. Naturf. Ges., I, p. 6, figs. 1–8.

Type Localities: Sicily and Spain, apparently Lower Italy also.

Range: Southwestern Europe and northwestern Africa.

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[1] Recorded also from Cameroon, see discussion above, p. 158.

Bufonidæ[1]

BUFO

Laurenti, 1768, 'Syn. Rept.,' p. 25 (part)
TYPE: *vulgaris* = *bufo*

Bufo angusticeps Smith

Bufo angusticeps Smith, 1849, 'Illus. Zool. S. Africa,' III, Pl. LXIX, figs. 1 and 1*a*. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 300.

TYPE LOCALITY: "Interior of South Africa."

RANGE: Cape Colony.[2]

Bufo anotis Boulenger

Bufo anotis Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 48, Pl. III; 1910, Ann. S. African Mus., V, p. 537.

TYPE LOCALITY: Chirinda Forest, southeastern Mashonaland.

RANGE: Known only from the type locality.

Bufo blanfordii Boulenger

Bufo blanfordii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 301, Pl. XIX; fig. 4.

TYPE LOCALITIES: Ain Sambar and Sooroo, Abyssinia.

RANGE: Eritrea south through Abyssinia to Gallaland.

Bufo brauni Nieden

Bufo brauni Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 450. Werner, 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 718.

TYPE LOCALITY: Amani, Tanganyika Territory.

RANGE: Tanganyika Territory.

Bufo buchneri Peters

Bufo buchneri Peters, 1882, Sitzber. Ges. Naturf. Freunde Berlin, p. 147.

TYPE LOCALITY: Lunda, Angola.

RANGE: Known only from the type locality.

Bufo carens Smith

Bufo carens Smith, 1849, 'Illus. Zool. S. Africa,' III, Pl. LXVIII, fig. 1. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 301 (part).

TYPE LOCALITY: "Interior of South Africa."

RANGE: South Africa and East Africa as far north as Nairobi, British East Africa.

Bufo chevalieri Mocquard

Bufo chevalieri Mocquard, 1908, Bull. Mus. Hist. Nat., Paris, XIV, p. 262.

TYPE LOCALITY: Ivory Coast.

RANGE: Known only from the Ivory Coast.

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[1] For use of this name see Noble, 1922.

[2] Recorded also from Transvaal and the Lake Region but perhaps through error.

Bufo chudeaui Chabanaud

Bufo chudeaui Chabanaud, 1919, Bull. Mus. Hist. Nat., Paris, p. 454.

Type Locality: Senegal: Bata marsh (Sahel de Nioro).

Range: Known only from the type locality.

Bufo dodsoni Boulenger

Bufo dodsoni Boulenger, 1895, Proc. Zoöl. Soc. London, p. 540, Pl. xxx, fig. 5.

Type Locality: Rassa Alla, Somaliland.

Range: The Sudan, Somali, and Galliland.

Bufo dombensis Bocage

Bufo dombensis Bocage, 1895, Jorn. Sci. Lisboa, (2) IV, p. 51. Boulenger, 1905, Proc. Zoöl. Soc. London, II, p. 250.

Type Locality: Dombé, southern Angola.

Range: Angola.

Bufo fenoulheti Hewitt and Methuen

Bufo fenoulheti Hewitt and Methuen, 1913, Trans. Roy. Soc. S. Africa, III, p. 108.

Type Locality: Newington and Woodbush, northeastern Transvaal.

Range: Northeastern Transvaal.

Bufo funereus Bocage

Bufo funereus Bocage, 1866, Jorn. Sci. Lisboa, I, p. 77. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' pp. 281 and 475.

Type Locality: Duque de Bragança, Angola.

Range: Dahomey, south through the Rain Forest to southern Angola.

Bufo gariepensis Smith

Bufo gariepensis Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. lxix, figs. 2 and 2*a*. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 174.

Type Locality: Banks of the Orange River.

Range: Cape Colony, Orange River Colony, and Natal.

Bufo lemairii Boulenger

Bufo lemairii Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 1, Pl. i, fig. 1.

Type Locality: Pweto, Lake Moero.

Range: Known only from the type locality.

Bufo lönnbergi Andersson

Bufo lönnbergi Andersson, 1911, Svenska Vetensk.-Akad. Handl., XLVII, No. 6, p. 35, Pl. ii.

Type Locality: Mount Kenia, Kenya Colony.

Range: Known only from the type locality.

Bufo mauritanicus Schlegel

Bufo mauritanicus Schlegel, 1841, in Wagner, 'Reisen in der Regentschaft Algier,' III, p. 134. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 298.

Type Locality: Algiers, Algeria.

Range: Africa north of the Sahara.

Bufo pentoni Anderson

Bufo pentoni Anderson, 1893, Ann. Mag. Nat. Hist., (6) XII, p. 440; 1898, Zoöl. Egypt, I, p. 355, Pl. L, fig. 4.

Type Locality: "Shaata Gardens, situated about one mile outside of Suakin," Egypt.

Range: Egypt as far south as Nigeria, northern Cameroon (Garua), the Sudan, and Eritrea.

Bufo polycercus Werner

Bufo polycercus Werner, 1897, Sitzber. Akad. Wiss., München, XXVII, p. 211; 1913, Denkschr. Akad. Wiss. Wien (math.-natur.), LXXXVIII, p. 719.

Type Locality: Cameroon.

Range: Rain Forest and outlying forest islands.[1]

Bufo preussi Matschie

Bufo preussi Matschie, 1893, Sitzber. Ges. Naturf. Freunde Berlin, p. 175. Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 158.

Type Locality: Buea, Cameroon.

Range: Cameroon.

Bufo regularis Reuss

Bufo regularis Reuss, 1834, Mus. Senckenberg., I, p. 60. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 298 (figured in Boulenger, 1907, Proc. Zoöl. Soc. London, II, p. 479, Pl. XXI, figs. 1–4).

Type Locality: Egypt.

Range: All of Africa except Barbary.

Bufo steindachnerii Pfeffer

Bufo steindachnerii Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, pt. 1, p. 103, Pl. II, fig. 8.

Type Locality: Kihengo, East Africa.

Range: Gallaland, south through Tanganyika Territory.

Bufo superciliaris Boulenger

Bufo superciliaris Boulenger, 1887, Proc. Zoöl. Soc. London, p. 565.

Type Locality: Rio del Rey, Cameroon.

Range: Rain Forest as far west as Nigeria.

Bufo taitanus Peters

Bufo taitanus Peters, 1878, Monatsber. Akad. Wiss. Berlin, p. 208, Pl. II, fig. 9. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 305.

Type Locality: Taita, East Africa.

Range: Abyssinia, south to Portuguese East Africa, west to Lake Tanganyika.

Bufo tuberosus Günther

Bufo tuberosus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 60, Pl. III, fig. C. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 304.

Type Locality: Fernando Po.

Range: Rain Forest as far west as Cameroon.

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[1] Recorded also from southern Somaliland but probably through error.

Bufo vertebralis Smith

Bufo vertebralis Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. lxviii, figs. 2 and 2*a*. Hewitt and Power, 1913, Trans. Roy. Soc. S. Africa, III, p. 173.

Type Locality: "Interior districts of southern Africa, northeast of the Cape Colony."

Range: Cape Colony and Orange River Colony.

Bufo viridis Laurenti

Bufo viridis Laurenti, 1768, 'Syn. Rept.,' pp. 27 and 111, Pl. i, fig. 1. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 297.

Type Locality: Vienna, Austria.

Range: Europe, Asia, and Africa north of the Sahara.

Bufo vittatus Boulenger

Bufo vittatus Boulenger, 1906, Proc. Zoöl. Soc. London, p. 573, fig. 98.

Type Locality: Entebbe, Uganda.

Range: Uganda and the Sudan.

Bufo vulgaris Laurenti

Bufo vulgaris Laurenti, 1768, 'Syn. Rept.,' pp. 28 and 125. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 303.

Type Locality: Not given, but by inference Europe.

Range: Europe, Asia, and northwestern Africa.

HELEOPHRYNE[1]

Sclater, 1899, Ann. S. African Mus., I, p. 110
Type: *purcelli*

Heleophryne natalensis Hewitt

Heleophryne natalensis Hewitt, 1913, Ann. Natal Mus., II, p. 477, Pl. xxxix.

Type Locality: Krantzkloof, Natal.

Range: Known only from the type locality.

Heleophryne purcelli Sclater

Heleophryne purcelli Sclater, 1899, Ann. S. African Mus., I, p. 111, Pl. v, figs. 3 and 3*a*. Hewitt, 1909, Ann. Transvaal Mus., II, p. 45.

Type Locality: Stellenbosch, Cape Colony.

Range: Known only from the type locality.

Heleophryne regis Hewitt

Heleophryne regis Hewitt, 1909, Ann. Transvaal Mus., II, p. 45; 1913, Ann. Natal Mus., II, p. 477, Pl. xxxiv.

Type Locality: Knysna, Cape Colony.

Range: Known only from the type locality.

NECTOPHRYNE

Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 202
Type: *afra*

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[1] For a discussion of the relationships of this genus see Noble, 1922.

Nectophryne afra Buchholz and Peters

Nectophryne afra Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 202, Pl. II, fig. 5. Roux, 1906, Proc. Zoöl. Soc. London, I, p. 59.

TYPE LOCALITY: Cameroon.

RANGE: Rain Forest as far west as southern Nigeria.

Nectophyrne batesii Boulenger

Nectophryne batesii Boulenger, 1913, Ann. Mag. Nat. Hist., (8) XII, p. 71, fig.

TYPE LOCALITY: Bitye, Ja River, Cameroon.

RANGE: Rain Forest as far west as the Ja River, Cameroon.

Nectophryne parvipalmata Werner

Nectophryne parvipalmata Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 201, Pl. II, figs. 7 and 7*a*. Roux, 1906, Proc. Zoöl. Soc. London, I, p. 61.

TYPE LOCALITY: "Kamerun?"

RANGE: Cameroon.

Nectophryne tornieri Roux

Nectophryne tornieri Roux, 1906, Proc. Zoöl. Soc. London, I, p. 63, Pl. II, fig. 4. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 450.

TYPE LOCALITY: Ukami, Tanganyika Territory.

RANGE: Tanganyika Territory.

Nectophryne werthi Nieden

Nectophryne werthi Nieden, 1910, Sitzber. Ges. Naturf. Ges. Freunde Berlin, p. 439.

TYPE LOCALITY: Dar-es-Salaam, East Africa.

RANGE: Known only from the type locality.

PSEUDOPHRYNE

Fitzinger, 1843, 'Syst. Rept.,' p. 32

TYPE: *australis*

Pseudophryne vivipara Tornier

Pseudophryne vivipara Tornier, 1905, Sitzber. Akad. Wiss. Berlin, II, p. 855 (part). Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 383.

TYPE LOCALITIES: Rungwe and Kinga Mountains, East Africa.

RANGE: Known only from the type localities.

WERNERIA

Poche, 1903, Zool. Anz., XXVI, p. 701

TYPE: *fulva*

Werneria fulva (Andersson)

Stenoglossa fulva Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 144.

Werneria fulva Poche, 1903, Zool. Anz., XXVI, p. 701.

TYPE LOCALITY: Cameroon range (Buea).

RANGE: Known only from the type locality.

Hylidæ

HYLA

Laurenti, 1768, 'Syn. Rept.,' p. 32 (part)
TYPE: *viridis*

Hyla arborea meridionalis Boettger

Hyla arborea var. *meridionalis* Boettger, 1875, Abh. Senck. Naturf. Ges., IX, p. 186. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 380 (part).

TYPE LOCALITIES: Southern France and Teneriffe.

RANGE: Northwest Africa, Madeira, Canary, and Balearic Islands, south of France, Italy, and the Pyrenean peninsula.

Hyla arborea savignyi Audouin

Hyla savignyi Audouin, 1812, 'Suppl. Rept.,' Pl. II, figs. 13_1 and 13_2.

Hyla arborea var. *savignyi* Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 380.

TYPE LOCALITY: Indefinite, probably Egypt.

RANGE: Probably Lower Egypt: also Corsica, Elba, Sardinia, Greek Archipelago, southwestern Asia, Corea, China, and Japan.

Hyla wachei Nieden

Hyla wachei Nieden, 1911, Sitzber. Ges. Naturf. Freunde Berlin, p. 285.

TYPE LOCALITY: Dire Daua, Abyssinia.

RANGE: Known only from the type locality.

Ranidæ

ARTHROLEPTIDES

Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 445
TYPE: *martiensseni*

Arthroleptides martiensseni Nieden

Arthroleptides martiensseni Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 445.

TYPE LOCALITY: Amani, Tanganyika Territory.

RANGE: Known only from the type locality.

ARTHROLEPTIS

Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 24
TYPE: *wahlbergii*

Arthroleptis adolfi-friederici Nieden

Arthroleptis adolfi-friederici Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 440; 1912,[1] 'Wiss. Ergeb. Deutsch. Zentr.-Afrika-Exp.,' IV, p. 175, Pl. V, figs. 4*a*-*e*.

TYPE LOCALITIES: Rugege forest, Lake Region.

RANGE: Cameroon eastward to the Lake Region.

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[1] Called *adolfi friderici* here.

Arthroleptis batesii Boulenger

Arthroleptis batesii Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 318.

Type Localities: Efulen and Zima, Cameroon.

Range: Cameroon.

Arthroleptis bottegi Boulenger

Arthroleptis bottegi Boulenger, 1895, Ann. Mus. Stor. Nat. Genova, (2) XV, p. 16, Pl. v, fig. 3.

Type Locality: Auata River, Somaliland.

Range: Somaliland, south to Uganda and Kilimanjaro, west to Garamba, Belgian Congo.

Arthroleptis boulengeri Witte

Arthroleptis boulengeri Witte, 1921, Rev. Zool. Afr., IX, p. 12, Pl. iv, fig. 2.

Type Locality: Saint Louis, Lake Tanganiko, Belgian Congo.

Range: Known only from the type locality.

Arthroleptis calcaratus (Peters)

Hemimantis calcaratus Peters, 1863, Monatsber. Akad. Wiss. Berlin, p. 452.

Arthroleptis .calcarata Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 210. Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 502.

Type Locality: Boutry, Ashanti.

Range: Ashanti to Gaboon, including Fernando Po and St. Thomas.

Arthroleptis carquejai Ferreira

Arthroleptis carquejai Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 165, fig. on Pl.

Type Locality: Cambondo, Angola.

Range: Known only from the type locality.

Arthroleptis dispar Peters

Arthroleptis dispar Peters, 1870, Monatsber. Akad. Wiss. Berlin, p. 649, Pl. ii, fig. 3. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117.

Type Locality: Prince's Island.

Range: Cameroon-Gaboon area, including St. Thomas and Prince's Island, north to French Guinea.

Arthroleptis fraterculus Chabanaud

Arthroleptis fraterculus Chabanaud, 1921, Bull. Com. Et. Hist. et Scient. A.O.F., p. 456, Pl. iii, figs. 4 and 5.

Type Locality: Macento, French Guinea.

Range: Known only from the type locality.

Arthroleptis feæ Boulenger

Arthroleptis feæ Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 161, Pl. i, figs. 4–6.

Type Locality: Prince's Island.

Range: Rain Forest as far west as Prince's Island, north to French Guinea.

Arthroleptis gutturosus Chabanaud

Arthroleptis gutturosus Chabanaud, 1921, Bull. Com. Et Hist. et Scient. A.O.F., p. 452, Pl. ii.

Type Locality: Sanikolé, Liberia.
Range: Known only from the type locality.

Arthroleptis lameerei Witte

Arthroleptis lameerei Witte, 1921, Rev. Zool. Afr., IX, p. 12, Pl. iv, fig. 1.
Type Locality: Lofoï (Katanga), Belgian Congo.
Range: Known only from the type locality.

Arthroleptis lightfooti Boulenger

Arthroleptis lightfooti Boulenger, 1910, Ann. S. African Mus., V, pp. 529 and 538.
Type Locality: Newlands, near Capetown.
Range: Known only from the type locality.

Arthroleptis lönnbergi Nieden

Arthroleptis lönnbergi Nieden, 1915, Mitt. Zool. Mus. Berlin, VII, p. 361.
Type Locality: Mombo, Usambara.
Range: Known only from Usambara, Tanganyika Territory.

Arthroleptis macrodactylus Boulenger

Arthroleptis macrodactylus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 117, Pl. xi, fig. 5. Andersson, 1905, Ark. Zool., Stockholm, II, No. 20, p. 14.
Type Locality: Gaboon.
Range: Cameroon-Gaboon area, eastward to Nyasaland.

Arthroleptis minutus Boulenger

Arthroleptis minutus Boulenger, 1895, Proc. Zoöl. Soc. London, p. 539, Pl. xxx, fig. 4; 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, pp. 161 and 163.
Type Locality: Durro, western Somaliland.
Range: Somaliland and British East Africa, westward across the Sudan to Portuguese Guinea.

Arthroleptis moorii Boulenger

Arthroleptis moorii Boulenger, 1898, Proc. Zoöl. Soc. London, p. 479, Pl. xxxviii, fig. 2.
Type Locality: Kinyamkolo, Lake Tanganyika.
Range: Lake Tanganyika to Stanley Pool.

Arthroleptis ogoensis Boulenger

Arthroleptis ogoensis Boulenger, 1906 (for 1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 162, Pl. i, figs. 7–8.
Type Locality: Lambaréné, Ogowe.
Range: French Congo, north to French Guinea.

Arthroleptis parvulus Boulenger

Arthroleptis parvulus Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 109, Pl. iv, figs. 3–3*b*.
Type Locality: Bange Ngola northeast Angola.
Range: Northeast Angola and region of the Lower Congo.

Arthroleptis pœcilonotus Peters

Arthroleptis pœcilonotus Peters, 1863, Monatsber. Akad. Wiss. Berlin, p. 446.

Type Locality: Boutry, Ashanti.
Range: Entire Rain Forest from Portuguese Guinea to the French Congo, and eastward to the Lake Region; recorded also from Usambara and Nyasaland.

Arthroleptis procterae Witte

Arthroleptis procterae Witte, 1921, Rev. Zool. Afr., IX, p. 11, Pl. III, fig. 2.
Type Locality: Beni (Kivu), Belgian Congo.
Range: Known only from the type locality.

Arthroleptis reichei Nieden

Arthroleptis reichei Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 437.
Type Locality: Crater Lake, Ngosi Volcano, north of Langenburg, Tanganyika Territory.
Range: Known only from the type locality.

Arthroleptis rouxi Nieden

Arthroleptis rouxi Nieden, 1912, 'Wiss. Ergeb. Deutsch. Zentr.-Afrika-Exp.,' IV, p. 178, Pl. v, figs. *5a–b*.
Type Locality: Buddu Forest, Lake Victoria.
Range: Known only from the type locality.

Arthroleptis schebeni Nieden

Arthroleptis schebeni Nieden, 1913, Sitzber. Ges. Naturf. Freunde Berlin, p. 451.
Type Locality: Klein Nauas, Southwest Africa.
Range: Southwest Africa.

Arthroleptis scheffleri Nieden

Arthroleptis scheffleri Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 438.
Type Localities: Kibwesi, Nairobi, Zanzibar, and M'papua, East Africa.
Range: Kenya Colony and Tanganyika Territory, westward to the Lake Region.

Arthroleptis schoutedeni Witte

Arthroleptis schoutedeni Witte, 1921, Rev. Zool. Afr., IX, p. 13, Pl. IV, fig. 3.
Type Locality: Lofoï (Katanga), Belgian Congo.
Range: Known only from the type locality.

Arthroleptis schubotzi Nieden

Arthroleptis schubotzi Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 440; 1912, 'Wiss. Ergeb. Deutsch. Zentr. Afrika Exp.,' IV, p. 177, Pl. v, fig. 3.
Type Locality: Usumbura, Tanganyika Territory.
Range: Known only from the type locality.

Arthroleptis spinalis Boulenger

Arthroleptis spinalis Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 2, p. 187.
Type Locality: St. Louis, Lake Tanganyika, Belgian Congo.
Range: Known only from the type locality.

Arthroleptis stenodactylus Pfeffer[1]

Arthroleptis stenodactylus Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, pt. 1, p. 93.

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[1] (= *A. whytii* auct.)

Type Locality: Kihengo, Tanganyika Territory.
Range: Portuguese East Africa and Nyasaland, northward to Tanganyika Territory; recorded also from Spanish Guinea but probably through error.

Arthroleptis tæniatus Boulenger

Arthroleptis tæniatus Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 319.
Type Locality: Zima, southern Cameroon.
Range: Known only from the type locality.

Arthroleptis tokba Chabanaud

Arthroleptis tokba Chabanaud, 1921, Bull. Com. Et. Hist. et Scient. A.O.F., p. 454, Pl. III, figs. 2, 3.
Type Localities: N'Zébéla and N'Zérékoré, French Guinea.
Range: Known only from the type localities.

Arthroleptis variabilis Matschie

Arthroleptis variabilis Matschie, 1893, Sitzber. Ges. Naturf. Freunde Berlin, p. 173.
Type Localities: Buea and Barombi, Cameroon.
Range: Rain Forest as far west as Cameroon and Fernando Po, north to French Guinea.

Arthroleptis wahlbergii Smith

Arthroleptis wahlbergii Smith, 1849, 'Illus. Zool. S. Africa,' III, Appendix, p. 24.
Type Locality: "Interior of Southern Africa."
Range: Cape Colony north to northern Tanganyika Territory.

Arthroleptis werneri Nieden

Arthroleptis werneri Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1 p. 242.
Type Localities: Banjo District and Bamenda, Cameroon.
Range: Known only from the type localities.

Arthroleptis xenochirus Boulenger

Arthroleptis xenochirus Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 108, Pl. IV, figs. 2 and 2*a*.
Type Locality: Marimba, Angola.
Range: Angola and Cameroon.

Arthroleptis xenodactylus Boulenger

Arthroleptis xenodactylus Boulenger, 1909, Ann. Mag Nat. Hist., (8) IV, p. 496.
Type Locality: Amani, Tanganyika Territory.
Range: Eastern end of the Rain Forest and the forest at Usambara.

ASTYLOSTERNUS

Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 200, figs.
Type: *diadematus*

Astylosternus diadematus Werner

Astylosternus diadematus Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 200, figs.

TYPE LOCALITY: Victoria, Cameroon.
RANGE: Cameroon.

Astylosternus oxyrchynchus Nieden[1]

Astylosternus oxyrchynchus Nieden, 1908, Zool. Anz., XXXII, p. 660; Mitt. Zool. Mus. Berlin, III, p. 499.

TYPE LOCALITY: Lolodorf, Cameroon.
RANGE: Cameroon.

Astylosternus robustus (Boulenger)

Trichobatrachus robustus Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 443, Pl. xxx; 1901, II, p. 709, Pl. xxxviii, fig. 1.

Astylosternus robustus Nieden, 1908, Zool. Anz., XXXII, p. 659.

TYPE LOCALITY: Benito River, Spanish Guinea.
RANGE: Spanish Guinea and Cameroon.

CARDIOGLOSSA

Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 445
TYPE: *gracilis*

Cardioglossa dorsalis (Peters)

Hylambates dorsalis Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 209, Pl. III, fig. 5.

Cardioglossa dorsalis Nieden, 1908, Zool. Anz., XXXII, p. 661.

TYPE LOCALITY: Yoruba, Lagos.
RANGE: Known only from the type locality.

Cardioglossa elegans Boulenger

Cardioglossa elegans Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321.

TYPE LOCALITY: Efulen, Cameroon.
RANGE: Known only from the type locality.

Cardioglossa escaleræ Boulenger

Cardioglossa escaleræ Boulenger, 1903, Mem. Soc. Esp. Nat. Hist., I, p. 64, Pl. v, fig. 4.

TYPE LOCALITY: Cape St. John, Spanish Guinea.
RANGE: Known only from the type locality.

Cardioglossa gracilis Boulenger

Cardioglossa gracilis Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 446, text fig. 2.

TYPE LOCALITY: Benito River, Spanish Guinea.
RANGE: Rain Forest, west to the Cameroon-Gaboon area.

Cardioglossa leucomystax (Boulenger)

Arthroleptis leucomystax Boulenger, 1903, Mem. Soc. Esp. Nat. Hist., I, p. 62, Pl. v, figs. 1–2.

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[1] Later corrected to *oxyrhynchus*.

Cardioglossa leucomystax Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 506.

TYPE LOCALITIES: Cape St. John and the Benito River, Spanish Guinea; and Kribi, Cameroon.

RANGE: Rain Forest, from Cameroon east nearly to Lake Albert Edward.

CHIROMANTIS

Peters, 1855, Arch. Naturg., XXI, part 1, p. 56
TYPE: *xerampelina*

Chiromantis kachowskii Nikolsky

Chiromantis kachowskii Nikolsky, 1900, Ann. Mus. Zool. St. Pétersbourg, V, p. 246.

TYPE LOCALITY: Ferad, Abyssinia.

RANGE: Known only from the type locality.

Chiromantis kelleri Boettger

Chiromantis kelleri Boettger, 1893, Zool. Anz., XVI, p. 131.

TYPE LOCALITY: Somaliland, Lake Laku and region north of Webi Valley.

RANGE: Known only from the type locality.

Chiromantis rufescens (Günther)

Polypedates rufescens Günther, 1868, Proc. Zoöl. Soc. London, p. 486.

Chiromantis rufescens Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 92, Pl. x, fig. 2.

TYPE LOCALITY: "West Africa."

RANGE: Rain Forest as far west as the Cameroon-Gaboon area; found also in Usambara, Tanganyika Territory, and reported, perhaps incorrectly, from the Zambezi.

Chiromantis petersii Boulenger

Chiromantis petersii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 93, Pl. x, fig. 1.

TYPE LOCALITY: "Interior of East Africa."

RANGE: Somaliland, south to Transvaal.

Chiromantis xerampelina Peters[1]

Chiromantis xerampelina Peters, 1855, Arch. Naturg., XXI, part 1, p. 56. Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 91.

TYPE LOCALITIES: Tette and Sena, Mozambique.

RANGE: Transvaal, north to Kenya Colony.

CONRAUA

Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 497
TYPE: *robusta*

Conraua robusta Nieden

Conraua robusta Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 497.

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[1] *Chiromantis umbelluzianus* (Ferreira, 1920, Jorn. Sci. Lisboa, (3) VIII, 6 pp., 2 pls.) seems to be hardly distinct from this species.

Type Locality: Cameroon.
Range: Known only from the type locality.

DIMORPHOGNATHUS

Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321, fig. 2
Type: *africanus*

Dimorphognathus africanus (Hallowell)

Heteroglossa africana Hallowell, 1857, Proc. Acad. Nat. Sci., Phila., p. 64.
Dimorphognathus africana Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 321, fig. 2.

Type Locality: Gaboon.
Range: Cameroon-Gaboon area.

GAMPSOSTEONYX

Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 442, Pl. XXIX
Type: *batesi*

Gampsosteonyx batesi Boulenger

Gampsosteonyx batesi Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 442, Pl. XXIX.

Type Locality: Benito River, Spanish Guinea.
Range: Cameroon-Gaboon area.

HYLAMBATES[1]

A. Duméril, 1853, Ann. Sci. Nat., (3) XIX, p. 162
Type: *maculatus*

Hylambates argenteus Pfeffer

Hylambates argenteus Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, pt. 1, p. 100, Pl. II, fig. 3.

Type Locality: Marsh south of Bagamoyo, Tanganyika Territory.
Range: Tanganyika Territory.

Hylambates bocagii (Günther)

Cystignathus bocagii Günther, 1864, Proc. Zoöl. Soc. London, p. 481, Pl. XXXIII, fig. 2.
Hylambates bocagii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 133, figs.

Type Locality: Duque de Bragança, Angola.
Range: Savannahs north and south of the Rain Forest; reported from Portuguese Guinea, Abyssinia, Kenya Colony, and Angola.

Hylambates brevipes Boulenger

Hylambates brevipes Boulenger, 1906 (1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 168, Pl. II, fig. 4.

Type Locality: Musola, Fernando Po.
Range: Known only from the type locality.

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[1] Many of the species included in this genus are probably referable to *Leptopelis*, see above discussion. p. 186.

Hylambates cassinoides Boulenger

Hylambates cassinoides Boulenger, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 556.

Type Locality: MacCarthy Island, Gambia.

Range: Known only from the type locality.

Hylambates christyi Boulenger

Hylambates christyi Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141.

Type Locality: Mabira Forest, Chagwe, Uganda.

Range: Known only from the type locality.

Hylambates enantiodactylus[1] Calabresi

Hylambates enantiodactylus Calabresi, 1916, Monitore Zool. Ital., XXVII, p. 36, Pl. ii, fig. 2.

Type Locality: Bardera, Somaliland.

Range: Known only from the type locality.

Hylambates greshoffiii Schilthuis

Hylambates greshoffiii Schilthuis, 1889, Tijd. Neder. Dier. Ver., (2) II, p. 286, fig.

Type Locality: Boma, Lower Congo.

Range: Belgian Congo, from Stanleyville to Boma.

Hylambates haugi Mocquard

Hylambates haugi Mocquard, 1902, Bull. Mus. Nat. Hist., Paris, VIII, p. 413.

Type Locality: Near Lambaréné, Gaboon.

Range: Known only from the type locality.

Hylambates hyloides Boulenger

Hylambates hyloides Boulenger, 1906 (1905), Ann. Stor. Nat. Genova, (3) II, p. 167, Pl. ii, figs. 1 and 2.

Type Locality: Bolama, Portuguese Guinea.

Range: Portuguese Guinea south to Liberia.

Hylambates johnstoni Boulenger

Hylambates johnstoni Boulenger, 1897, Proc. Zoöl. Soc. London, p. 803, Pl. xlvi, fig. 4.

Type Locality: Kondowe-Karonga and Nyika Plateau, Nyasaland.

Range: Transvaal, north to Usambara, Tanganyika Territory.

Hylambates leonardi Boulenger

Hylambates leonardi Boulenger, 1906 (1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 167, Pl. ii, fig. 3. Nieden, 1909, Arch. Naturg., LXXV, part 1, p. 362, figs. 1 and 2.

Type Localities: Punta Frailes, Fernando Po, and N'Djolè, French Congo.

Range: Cameroon-Gaboon area including Fernando Po.

Hylambates maculatus A. Duméril

Hylambates maculatus A. Duméril, 1853, Ann. Sci. Nat., (3) XIX, p. 165, Pl. vii, figs. 1–1*b* and 4. Peters, 1882, 'Reise nach Mossambique,' III, p. 159, Pl. xxvi, fig. 4.

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[1] This species will doubtlessly be demonstrated to be a *Chiromantis* and for that reason it is not included in the key.

Type Locality: Zanzibar.
Range: Mozambique, north to Zanzibar.

Hylambates marginatus Bocage

Hylambates marginatus Bocage, 1895, 'Herpétol. Angola,' p. 178.
Type Locality: Quissange, interior of Benguella, Angola.
Range: Angola.

Hylambates natalensis (A. Smith)

Polypedates natalensis A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 25.
Hylambates natalensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 135, figs.
Type Locality: "Small river a little to the westward of Port Natal."
Range: Natal.

Hylambates ragazzii Boulenger

Hylambates ragazzii Boulenger, 1896, Ann. Mus. Stor. Nat. Genova, (2) XVI, p. 554.
Type Locality: Shoa, Abyssinia.
Range: Known only from the type locality.

Hylambates vannutellii Boulenger

Hylambates vannutellii Boulenger, 1898, Ann. Mus. Stor. Nat. Genova, (2*a*) XVIII, p. 722, Pl. x, fig. 3.
Type Locality: "Between Badditù and Dimè," Somaliland.
Range: Known only from the type locality.

Hylambates vermiculatus Boulenger

Hylambates vermiculatus Boulenger, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 497. Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 448.
Type Locality: Amani, Tanganyika Territory.
Range: Tanganyika Territory.

Hylambates verrucosus Boulenger

Hylambates verrucosus Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141.
Type Locality: Mabira Forest, Chagwe, Uganda.
Range: Known only from the type locality.

HYPEROLIUS

Rapp, 1842, Arch. Naturg., VIII, part 1, p. 289
Type: *marmoratus*

Hyperolius acutirostris Buchholz and Peters

Hyperolius acutirostris Buchholz and Peters, 1875, in Peters, Monatsber. Akad. Wiss. Berlin, p. 207, Pl. ii, fig. 4.
Rappia acutirostris Tornier, 1896, 'Kriechthiere Deutsch-Ost-Afrikas,' p. 154.
Type Locality: Cameroon.
Range: Rain Forest as far west as Nigeria.

Hyperolius argus Peters

Hyperolius argus Peters, 1855, Arch. Naturg., part 1, p. 57.

Rappia argus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 122.
Type Locality: Boror, Mozambique.
Range: Mozambique and Nyasaland to Tanganyika Territory.

Hyperolius aylmeri (E. G. Boulenger)

Rappia aylmeri E. G. Boulenger, 1915, Proc. Zoöl. Soc. London, I, p. 243.
Type Locality: Sierra Leone.
Range: Known only from the type locality.

Hyperolius balfouri (Werner)

Rappia balfouri Werner, 1907, Sitzber. Akad. Wiss. Wien (math.-natur.), CXVI, Abt. 1, part 2, p. 1904, Pl. iv, fig. 15.
Type Locality: Gondokoro, Sudan.
Range: Known only from the type locality.

Hyperolius bayoni (Boulenger)

Rappia bayoni Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 168.
Type Localities: Uganda: Bussu, Bululo, Mbale, Jinja, Kabulamuliro, and Entebbe.
Range: Known only from the type localities.

Hyperolius benguellensis (Bocage)

Rappia benguellensis Bocage, 1983, Jorn. Sci. Lisboa, (2) III, p. 119.
Type Locality: Cahata, Angola.
Range: Angola.

Hyperolius ferreirai Noble

Rappia bivittatus[1] Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 161, Pl.
Type Localities: Angola: Rio Luinha, Quilombo, N'gollo Bumba.
Range: Known only from the type localities.

Hyperolius bocagei Steindachner

Hyperolius bocagei Steindachner, 1869, 'Reise Novara, Zool., I, Amph.,' p. 51, Pl. v, fig. 11.
Type Locality: Angola.
Range: Angola.

Hyperolius burgeoni (Witte)

Rappia burgeoni Witte, 1921, Rev. Zool. Afr., IX. p. 19, Pl. v, fig. 2.
Type Locality: Madyu (Uelé), Belgian Congo.
Range: Known only from the type locality.

Hyperolius burtonii (Boulenger)

Rappia burtonii Boulenger, 1883, Ann. Mag. Nat. Hist., (5) XII, p. 163.
Type Locality: Ancober River, Gold Coast.
Range: Known only from the type locality.

Hyperolius chlorosteus (E. G. Boulenger)

Rappia chlorostea E. G. Boulenger, 1915, Proc. Zoöl. Soc. London, I, p. 243.
Type Locality: Sierra Leone.
Range: Known only from the type locality.

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[1] This name is preoccupied by *Hyperolius bivittatus* Peters, 1855, Arch. Naturg., part 1, p. 56.

Hyperolius cinctiventris Cope

Hyperolius cinctiventris Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 324.
Rappia cinctiventris Boettger, 1888, Ber. Senck. Ges., p. 98.

Type Locality: Umvoti, Natal.

Range: All of Africa, exclusive of the Rain Forest, from French Guinea, Somaliland and the Sudan, southward.

Hyperolius cinnamomeo-ventris Bocage

Hyperolius cinnamomeo-ventris Bocage, 1866, Jorn. Sci. Lisboa, I, p. 75.
Rappia cinnamomeiventris Bocage, 1895, 'Herpétol. Angola,' p. 172, Pl. XIX, fig. 1.

Type Locality: Duque de Bragança, Angola.

Range: Angola.

Hyperolius concolor (Hallowell)

Ixalus concolor Hallowell, 1844, Proc. Acad. Nat. Sci., Phila., II, p. 60.
Rappia concolor Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 124.

Type Locality: Liberia.

Range: All of Africa from Portuguese Guinea and Kenya Colony south to Angola and Mozambique; not reported from the Congo Basin.

Hyperolius fasciatus(Ferreria)

Rappia fasciata Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 164, fig. on Pl.

Type Locality: Quilombo, Angola.

Range: Known only from the type locality.

Hyperolius ferniquei (Mocquard)

Rappia ferniquei Mocquard, 1902, Bull. Mus. Hist. Nat., Paris, VIII, p. 407.

Type Locality: Atchi River, Kenya Colony.

Range: Known only from the type locality.

Hyperolius fimbriolatus Buchholz and Peters

Hyperolius fimbriolatus Buchholz and Peters, in Peters, 1876, Monatsber. Akad. Wiss. Berlin, p. 121.

Type Locality: Lambaréné, French Congo.

Range: Cameroon-Gaboon area and the Lower Congo.

Hyperolius flavoviridis Peters

Hyperolius flavoviridis Peters, 1855, Arch. Naturg., XXI, part 1, p. 57.

Type Locality: Boror, Mozambique.

Range: Mozambique to Kenya Colony.

Hyperolius fulvovittatus Cope

Hyperolius fulvovittatus Cope, 1860, Proc. Acad. Nat. Sci. Phila., p. 517.

Type Locality: Liberia.

Range: Zanzibar to Nyasaland, also Angola.

Hyperolius fuscigula Bocage

Hyperolius fuscigula Bocage, 1866, Jorn. Sci. Lisboa, I, p. 76.

Type Locality: Duque de Bragança, Angola.

Range: Liberia to Angola.

Hyperolius fusciventris Peters

Hyperolius fusciventris Peters, 1876, Monatsber. Akad. Wiss. Berlin, p. 122.

Type Locality: Liberia.

Range: Spanish Guinea to Liberia.

Hyperolius granulatus (Boulenger)

Rappia granulata Boulenger, 1901, Ann. Mus. Congo., (1) II, fasc. 1, p. 4, Pl. II, fig. 3.

Type Locality: Pweto, Lake Moero.

Range: Lake Moero and Tanganyika Territory.

Hyperolius guttatus Peters

Hyperolius guttatus Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 207, Pl. II, fig. 3.

Type Locality: Boutry, Ashanti.

Range: Ashanti to Cameroon.

Hyperolius guttulatus Günther

Hyperolius guttulatus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 86, Pl. VII, fig. *A*.

Type Locality: Africa.

Range: Known only from the type specimens.

Hyperolius horstockii (Schlegel)

Hyla horstockii Schlegel, 1844, 'Abbildung.,' p. 24.

Hyperolius horstockii Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 85.

Type Locality: Northern part of Cape of Good Hope.

Range: South Africa as far north as northern Rhodesia.

Hyperolius lagoensis (Günther)

Rappia lagoensis Günther, 1868, Proc. Zoöl. Soc. London, p. 487, Pl. XL, fig. 2.

Hyperolius lagoensis 1875, Peters, Monatsber. Akad. Wiss. Berlin, p. 207.

Type Locality: Lagos.

Range: Lagos and Nigeria.

Hyperolius langi Noble

Hyperolius langi Noble, see above, p. 266, Pl. XXXIX, fig. 1.

Type Locality: Niapu, Belgian Congo.

Range: Known only from the type locality.

Hyperolius marmoratus Rapp[1]

Hyperolius marmoratus Rapp, 1842, Arch. Naturg., VIII, part 1, p. 289, Pl. VI, figs. 1 and 2.

Type Locality: Natal.

Range: All of Africa from Portuguese Guinea and Kenya Colony southward.

Hyperolius microps Günther

Hyperolius microps Günther, 1864, Proc. Zoöl. Soc. London, p. 311, Pl. XXVII, fig. 3.

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[1] *Rappia soror* Chabanaud, 1921, p. 458, seems to belong here.

Type Locality: Rovuma Bay, East Africa.
Range: Mozambique to Angola; recorded probably through error from French Guinea.

Hyperolius molleri (Bedriaga)

Rappia molleri Bedriaga, 1892, 'Amph. Rept. Guinée,' p. 10.[1]
Type Locality: S. Thomé.
Range: S. Thomé.

Hyperolius nasutus Günther

Hyperolius nasutus Günther, 1864, Proc. Zoöl. Soc. London, p. 482, Pl. xxxiii, fig. 3.
Type Locality: Duque de Bragança, Angola.
Range: The Sudan to southern Rhodesia, westward south of the Rain Forest to Angola and the Lower Congo.

Hyperolius ocellatus Günther

Hyperolius ocellatus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. vii, fig. *B*.
Type Localities: Fernando Po and Angola.
Range: Angola and the Rain Forest, west to Cameroon.

Hyperolius osorioi (Ferreira)

Rappia osorioi Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 162, fig. on Pl.
Type Locality: Quilombo, Angola.
Range: Known only from the type locality.

Hyperolius oxyrhynchus (Boulenger)

Rappia oxyrhynchus Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 5, Pl. ii, fig. 4.
Type Localities: Pweto and Lofoi, Belgian Congo.
Range: Known only from the type localities.

Hyperolius pachydermus (Werner)

Rappia pachyderma Werner, 1907, Sitzber. Akad. Wiss. (math.-natur.), Wien, CXVI, part 1, p. 1903.
Type Locality: Gondokoro, Sudan.
Range: Known only from the type locality.

Hyperolius phantasticus (Boulenger)

Rappia phantastica Boulenger, 1899, Ann. Mag. Nat. Hist., (7) III, p. 274, Pl. xi, fig. 2.
Type Locality: Benito River, Gaboon.
Range: Rain Forest as far west as Cameroon.

Hyperolius picturatus Peters

Hyperolius picturatus Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 206, Pl. ii, fig. 2.
Type Locality: Boutry, Ashanti.
Range: Rain Forest and Kenya Colony.

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[1] This paper not examined, but the description appearing in another form (Bedriaga, 1892) has been available.

Hyperolius platycephalus (Pfeffer)

Rappia platycephala Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 96, Pl. II, fig. 2.

Type Locality: Quilimane, Mozambique.

Range: Mozambique.

Hyperolius platyceps (Boulenger)

Rappia platyceps Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 444, Pl. XXVII, fig. 4.

Type Locality: Benito River, Gaboon.

Range: Cameroon and Angola.[1]

Hyperolius platyrhinus (Procter)

Rappia platyrhinus Procter, 1920, Proc. Zoöl. Soc. London, p. 416.

Type Locality: Nairobi, Kenya Colony.

Range: Known only from the type locality.

Hyperolius pleurotænius (Boulenger)

Rappia pleurotænia Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322.

Type Localities: Zima, Cameroon and Benito River, Spanish Guinea.

Range: Cameroon-Gaboon area and Upper Congo.

Hyperolius pliciferus (Bocage)

Rappia plicifera Bocage, 1893, Jorn. Sci. Lisboa, (2) III, p. 118.

Type Locality: Caconda and Duque de Bragança, Angola.

Range: Angola.

Hyperolius punctulatus (Bocage)

Rappia punctulata Bocage, 1895, 'Herpétol. Angola,' p. 168.

Type Locality: Banks of the Quanza River, Angola.

Range: Angola.

Hyperolius pusillus (Cope)

Crumenifera pusilla Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 343.

Rappia pusilla Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 127.

Type Locality: Umvoti, Natal.

Range: Nigeria and the Sudan southward to Natal.

Hyperolius quinquevittatus Bocage

Hyperolius quinquevittatus Bocage, 1866, Jorn. Sci. Lisboa, I, p. 77.

Type Locality: Duque de Bragança, Angola.

Range: Angola and the Upper Congo.

Hyperolius rhodoscelis (Boulenger)

Rappia rhodoscelis Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 3, Pl. II, fig. 1.

Type Locality: Pweto, Lake Moero.

Range: Known only from the type locality.

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[1] *H. platyceps* var. *angolensis* (Ferreira) may not be conspecific with *H. platyceps*, in which case the range of the latter form would be restricted to the Cameroon-Gaboon area.

Hyperolius riggenbachi (Nieden)

Rappia riggenbachi Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1, p. 244, fig. 4.

Type Locality: Banjo, Cameroon.

Range: Known only from the type locality.

Hyperolius salinæ (Bianconi)

Euchnemis salinæ Bianconi, 1850, 'Spec. Zool. Mosamb., Rept.,' p. 24, Pl. v, fig. 2.

Rappia salinæ Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 123.

Type Locality: Mozambique.

Range: Kenya Colony to Mozambique.

Hyperolius sansibarica (Pfeffer)

Rappia sansibarica Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 97, Pl. ii, fig. 4.

Type Locality: Zanzibar.

Range: From Zanzibar to Bukoba, Tanganyika Territory.

Hyperolius seabrai (Ferreira)

Rappia seabrai Ferreira, 1906, Jorn. Sci. Lisboa, (2) VII, p. 163, fig. on Pl.

Type Locality: Duque de Bragança, Angola.

Range: Known only from the type locality.

Hyperolius sordidus (Fischer)

Rappia sordida Fischer, 1888, Jahrb. Hamburg. Wiss. Anst., V, p. 10.

Type Locality: Cameroon.

Range: Rain Forest.

Hyperolius spurrelli (Boulenger)

Rappia spurrelli Boulenger, 1917, Ann. Mag. Nat. Hist., (8) XIX, p. 408.

Type Locality: Obuasi, southern Ashanti.

Range: Known only from the type locality.

Hyperolius steindachnerii Bocage

Hyperolius steindachnerii Bocage, 1866, Jorn. Sci. Lisboa, I, p. 75.

Type Locality: Duque de Bragança, Angola.

Range: Angola and the Rain Forest as far west as Cameroon.

Hyperolius sugillatus Cope

Hyperolius sugillatus Cope, 1862, Proc. Acad. Nat. Sci., Phila., p. 342.

Type Locality: Umvoti, Natal.

Range: Natal to Angola.

Hyperolius symetricus (Cope)

Rappia symetrica Mocquard, 1902, Bull. Mus. Hist. Nat., VIII, p. 408.

Type Locality: Atchi River, Kenya Colony.

Range: Kenya Colony.

Hyperolius thomensis Bocage

Hyperolius thomensis Bocage, 1886, Jorn. Sci. Lisboa, XI, p. 74.

Type Locality: S. Thomé.

Range: S. Thomé.

Hyperolius toulsonii Bocage

Hyperolius toulsonii Bocage, 1867, Proc. Zoöl. Soc. London, p. 845, fig. 3.
Type Locality: Loanda, Angola.
Range: Angola.

Hyperolius tristis Bocage

Hyperolius tristis Bocage, 1866, Jorn. Sci. Lisboa, I, p. 76.
Rappia tristis Bocage, 1895, 'Herpétol. Angola,' p. 171, Pl. xix, fig. 2.
Type Locality: Duque de Bragança, Angola.
Range: Angola and the Lower Congo.

Hyperolius tuberilinguis Smith

Hyperolius tuberilinguis Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 26.
Type Locality: "Country to the eastward of Cape Colony."
Range: Caffraria.

Hyperolius undulatus (Boulenger)

Rappia undulata Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 4, Pl. II, fig. 2.
Type Localities: Pweto and Lofoi, Belgian Congo.
Range: Lake Moero to Cape Colony.

Hyperolius vermiculatus (Pfeffer)

Rappia vermiculata Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 98, Pl. I, fig. 12.
Type Locality: Zanzibar.
Range: Known only from the type locality.

Hyperolius viridiflavus (Duméril and Bibron)

Eucnemis viridi-flavus Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 528.
Type Locality: Abyssinia.
Range: Abyssinia, Somaliland, and Uganda.

KASSINA

Girard, 1853, Proc. Acad. Nat. Sci. Phila., VI, p. 421
Type: *senegalensis*

Kassina obscura Boulenger

Cassina obscura Boulenger, 1894, Proc. Zoöl. Soc. London, p. 644, Pl. xxxix, fig. 3. Peracca, 1909, in Abruzzi, 'Il Ruwenzori,' Parte Scientifica, I, p. 177.
Type Locality: Let Merafia, Shoa, Abyssinia.
Range: Abyssinia, south to the Sudan, Uganda, and Gallaland.

Kassina senegalensis (Duméril and Bibron)

Cystignathus senegalensis Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 418.
Cassina senegalensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 131.
Type Locality: Lakes in the vicinity of Galam, Senegal.
Range: Open country south of the Sahara; accidental in the Rain Forest.

LEPTODACTYLODON

Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 141
TYPE: *ovatus*

Leptodactylodon albiventris (Boulenger)

Bulua albiventris Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XV, p. 283.
Leptodactylodon albiventris Nieden, 1908, Mitt. Zool. Mus. Berlin, III, part 4 p. 501.
TYPE LOCALITY: Efulen, Cameroon.
RANGE: Cameroon.

Leptodactylodon boulengeri Nieden

Leptodactylodon boulengeri Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1, p. 242, fig. 2.
TYPE LOCALITY: Banjo, Cameroon.
RANGE: Known only from the type locality.

Leptodactylodon ovatus Andersson

Leptodactylodon ovatus Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 141
TYPE LOCALITY: Cameroon.
RANGE: Cameroon.

LEPTOPELIS

Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 89
TYPE: *aubryi*

Leptopelis anchietæ (Bocage)

Hylambates anchietæ Bocage, 1873, Jorn. Sci. Lisboa, IV, p. 226. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 133.
TYPE LOCALITY: Interior to Mossamedes, Angola.
RANGE: Savannahs directly to the north, east, and south of the Rain Forest; best known from Angola.

Leptopelis aubryi (A. Duméril)

Hyla aubryi A. Duméril, 1856, Rev. Mag. Zool., (2) VIII, p. 561.
Leptopelis aubryi Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 89.
TYPE LOCALITY: Gaboon.
RANGE: Rain Forest, the forest at Amani, East Africa, and possibly other Rain Forest "outlyers."

Leptopelis brevirostris (Werner)

Hylambates brevirostris Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 199, Pl. II, figs. 5 and 6. Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 445.
TYPE LOCALITY: Victoria, Cameroon.
RANGE: Cameroon-Gaboon area including Fernando Po; reported also from Tanganyika Territory.

Leptopelis calcaratus (Boulenger)

Hylambates calcaratus Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 322.

Type Localities: Efulen, Cameroon; Cape St. John and Rio Benito, Spanish Guinea.

Range: Cameroon-Gaboon area.

Leptopelis notatus (Buchholz and Peters)

Hylambates notatus Buchholz and Peters, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 205, Pl. II, fig. 1.

Type Locality: Cameroon.

Range: Cameroon-Gaboon area.

Leptopelis palmatus (Peters)

Hylambates palmatus Peters, 1868, Monatsber. Akad. Wiss. Berlin, p. 453, Pl. II, fig. 2.

Type Locality: Prince's Island.

Range: Cameroon-Gaboon area including Fernando Po and Prince's Island.

Leptopelis rufus Reichenow

Leptopelis rufus Reichenow, 1874, Arch. Naturg., XL, part 1, p. 291, Pl. IX, figs. 1*a* and 1*b*.

Type Locality: Victoria, Cameroon (at foot of Cameroon Mountains).

Range: Rain Forest and the forest at Usambara, Tanganyika Territory.

Leptopelis tessmanni (Nieden)

Hylambates tessmanni Nieden, 1909, Arch. Naturg., LXXV, part 1, p. 365, fig. 4.

Type Locality: Makomo, Spanish Guinea.

Range: Cameroon-Gaboon area.

MEGALIXALUS

Günther, 1868, Proc. Zoöl. Soc. London, p. 485
Type: *infrarufus = seychellensis*

Megalixalus brachycnemis Boulenger

Megalixalus brachycnemis Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVII, p. 403, Pl. XVII, fig. 2.

Type Locality: Chiradzulu, Nyasaland.

Range: Nyasaland.

Megalixalus flavomaculatus (Günther)

Hyperolius flavomaculatus Günther, 1864, Proc. Zoöl. Soc. London, p. 310, Pl. XXVII, fig. 1.

Megalixalus flavomaculatus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 128.

Type Locality: Rovuma Bay, East Africa.

Range: Known only from the type locality.

Megalixalus fornasinii (Bianconi)

Euchnemis fornasinii Bianconi, 1850, 'Spec. Zool. Mosamb., Rept.,' Pl. V, fig. 1.

Megalixalus fornasinii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130.

Type Locality: Mozambique.

Range: Rain Forest and East Africa, from Pemba Island south to Marianhill, Natal.

Megalixalus gramineus Boulenger

Megalixalus gramineus Boulenger, 1898, Ann. Mus. Stor. Nat. Genova, (2) XVIII, p. 721, Pl. x, fig. 2.

Type Locality: Between Badditù and Dimé, Kenya Colony.

Range: Kenya Colony.

Megalixalus immaculatus Boulenger

Megalixalus immaculatus Boulenger, 1903, Mem. Soc. Esp. Hist. Nat., I, p. 63, Pl. v, fig. 3.

Type Locality: Cape St. John, Spanish Guinea.

Range: Spanish Guinea and French Congo.

Megalixalus leptosomus (Peters)

Hyperolius leptosomus Peters, 1877, Monatsber. Akad. Wiss. Berlin, p. 619, Pl., fig. 5.

Megalixalus leptosomus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 129.

Type Locality: Chinchoxo, Portuguese Congo.

Range: Rain Forest, Sudan, and Tanganyika Territory.

Megalixalus lindholmi Andersson

Megalixalus lindholmi Andersson, 1907, Jahrb. Nassau. Ver. Naturk., LX, p. 239, figs. 4–6.

Type Locality: Bibundi, Cameroon.

Range: Cameroon.

Megalixalus loveridgii Procter

Megalixalus loveridgii Procter, 1920, Proc. Zoöl. Soc. London, p. 418.

Type Locality: Morogoro, Tanganyika Territory.

Range: Known only from the type locality.

Megalixalus pantherinus Steindachner

Megalixalus pantherinus Steindachner, 1891, Anz. Akad. Wiss. Wien, XXVIII, No. 14, p. 142.

Type Locality: Leikipia, Kenya Colony.

Range: Known only from the type locality.

Megalixalus spinifrons (Cope).

Hyperolius spinifrons Cope, 1862, Proc. Acad. Nat. Sci. Phila., p. 342.

Megalixalus ? spinifrons Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130.

Type Locality: Umvoti, Natal.

Range: Cape Colony and Natal.

Megalixalus spinosus (Buchholz and Peters)

Hyperolius spinosus Buchholz and Peters, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 208, Pl. i, fig. 3.

Megalixalus spinosus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 130.

Type Locality: Cameroon.

Range: Rain Forest as far west as the Cameroon-Gaboon area.

Megalixalus vittiger (Peters)

Hyperolius vittiger Peters, 1876, Monatsber. Akad. Wiss. Berlin, p. 122.

Megalixalus vittiger Boulenger, 1911, Ann. Mus. Stor. Nat. Genova, (3) V, p. 169.

Type Locality: Liberia.

Range: Rain Forest and Uganda.

NYCTIBATES

Boulenger, 1904, Ann. Mag. Nat. Hist., (7) XIII, p. 261

Type: *corrugatus*

Nyctibates corrugatus Boulenger

Nyctibates corrugatus Boulenger, 1904, Ann. Mag. Nat. Hist., (7) XIII, p. 261.

Type Locality: Efulen, Cameroon.

Range: Cameroon.

PETROPEDETES

Reichenow, 1874, Arch. Naturg., XL, part 1, p. 290

Type: *cameronensis*

Petropedetes cameronensis Reichenow

Petropedetes cameronensis Reichenow, 1874, Arch. Naturg., XL, part 1, p. 290, Pl. IX, figs. 2, 2*a* and 2*b*. Boulenger, 1906 (1905), Ann. Mus. Stor. Nat. Genova, (3) II, p. 164, fig.

Type Locality: Bimbia, Cameroon.

Range: Cameroon and Fernando Po.

Petropedetes johnstoni (Boulenger)

Cornufer johnstoni Boulenger, 1887, Proc. Zoöl. Soc. London, p. 564.

Petropedetes johnstoni Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 439.

Type Locality: Rio del Rey, Cameroon.

Range: Cameroon.

Petropedetes natator Boulenger

Petropedetes natator Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XV, p. 281.

Type Locality: Sierra Leone.

Range: Known only from the type locality.

Petropedetes newtonii (Bocage)

Tympanoceros newtonii Bocage, 1895, Jorn. Sci. Lisboa, (2) III, p. 270; IV, p. 18, Pl.

Petropedetes newtoni Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 439.

Type Locality: Fernando Po.

Range: Cameroon-Gaboon area including Fernando Po.

Petropedetes palmipes Boulenger

Petropedetes palmipes Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XV, p. 282.

Type Locality: Efulen, Cameroon.

Range: Cameroon.

PHRYNOBATRACHUS

Günther, 1862, Proc. Zoöl. Soc. London, p. 190
TYPE: *natalensis*

Phrynobatrachus acridoides (Cope)

Staurois acridoides Cope, 1867, Journ. Acad. Nat. Sci. Phila., VI, p. 198.
Phrynobatrachus acridoides Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 113.

TYPE LOCALITY: Zanzibar.

RANGE: Mozambique to Eritrea in the east, Gambia to the French Congo in the west; not known from the interior of the continent except for a number of records from Nyasaland and the East African highlands.

Phrynobatrachus acutirostris Nieden

Phrynobatrachus acutirostris Nieden, 1912, 'Wiss. Ergeb. Deutsch.-Zentr. Afrika Exp.,' IV, p. 173, figs. 1*a-c*.

TYPE LOCALITY: Rugege Forest, Lake Region.

RANGE: Lake Region.

Phrynobatrachus bonebergi (Hewitt and Methuen)

Natalobatrachus bonebergi Hewitt and Methuen, 1913, Trans. Roy. Soc. S. Africa, III, p. 107.

TYPE LOCALITY: Marianhill, Natal.

RANGE: Known only from the type locality.

Phrynobatrachus capensis Boulenger

Phrynobatrachus capensis Boulenger, 1910, Ann. S. African Mus., V, pp. 529 and 538.

TYPE LOCALITY: Cape Flats, Cape Colony.

RANGE: Known only from the type locality.

Phrynobatrachus dendrobates (Boulenger)

Arthroleptis dendrobates Boulenger, 1919, Rev. Zool. Africaine, VII, fasc. 1, p. 8.

TYPE LOCALITY: Medje, Belgian Congo.

RANGE: Ituri Forest, Belgian Congo.

Phrynobatrachus francisci Boulenger

Phrynobatrachus francisci Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 141.

TYPE LOCALITY: Province of Zaria, Northern Nigeria.

RANGE: Senegambia to the French Congo.

Phrynobatrachus giorgii Witte

Phrynobatrachus giorgii Witte, 1921, Rev. Zool. Afr., IX, p. 8, Pl. III, fig. 1.

TYPE LOCALITY: Yambata, Lower Congo.

RANGE: Known only from the type locality.

Phrynobatrachus graueri (Nieden)

Arthroleptis graueri Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 441.
Phrynobatrachus graueri Nieden, 1912, 'Wiss. Ergeb. Deutsch.-Zentr. Afrika Exp.,' IV, p. 174, Pl. V, figs. 2*a-b*.

TYPE LOCALITY: Rugege Forest, Lake Region.

RANGE: Known only from the type locality.

Phrynobatrachus krefftii Boulenger

Phrynobatrachus krefftii Boulenger, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 496.
TYPE LOCALITY: Amani, Tanganyika Territory.
RANGE: Tanganyika Territory and the Belgian Congo as far west as the Rain Forest.

Phrynobatrachus natalensis (A. Smith)

Stenorhynchus natalensis A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Appendix, p. 24.
Phrynobatrachus natalensis Günther, 1862, Proc. Zoöl. Soc. London, p. 190.
TYPE LOCALITY: Port Natal.
RANGE: All of Africa, south of the Sahara and exclusive of the Rain Forest (possibly encroaching upon the border of the latter).

Phrynobatrachus perpalmatus Boulenger

Phrynobatrachus perpalmatus Boulenger, 1898, Proc. Zoöl. Soc. London, p. 479, Pl. XXXVIII, fig. 1.
TYPE LOCALITY: Lake Moero.
RANGE: Lake Moero, north to El Gerassi, Egypt, including the Ituri Forest.

Phrynobatrachus plicatus (Günther)

Hyperolius plicatus Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 88, Pl. VII, fig. *C*.
Phrynobatrachus plicatus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 112.
TYPE LOCALITY: Coast of Guinea.
RANGE: Rain Forest and outlying forested regions to the east; recorded perhaps incorrectly from northern Rhodesia; not reported further west than Nigeria.

Phrynobatrachus steindachneri Nieden

Phrynobatrachus steindachneri Nieden, 1910, Arch. Naturg., LXXVI, part 1, Heft 1, p. 241.
TYPE LOCALITY: Banjo, Cameroon.
RANGE: Known only from the type locality.

Phrynobatrachus tellinii Peracca

Phrynobatrachus tellinii Peracca, 1904, Boll. Mus. Torino, XIX, No. 467, p. 4.
TYPE LOCALITY: Between Massaua and Cheren, Eritrea.
RANGE: Known only from the type locality.

PHRYNOPSIS

Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, p. 101, Pl. II, figs. 5 and 6
TYPE: *boulengerii*

Phrynopsis boulengerii Pfeffer

Phrynopsis boulengerii Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, p. 101, Pl. II, figs. 5 and 6.
TYPE LOCALITY: Quilimane, Mozambique.
RANGE: Mozambique.

Phrynopsis ventrimaculata Nieden

Phrynopsis ventrimaculata Nieden, 1908, Mitt. Zool. Mus. Berlin, III, p. 499.

TYPE LOCALITY: Longji, Cameroon.

RANGE: Known only from the type locality.

RANA

Linnæus, 1758, 'Syst. Nat.,' 10th Ed., I, p. 210
TYPE: *temporaria*

Rana adspersa (Duméril and Bibron)

Pyxicephalus adspersus Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 444.

Rana adspersa Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 33, fig.

TYPE LOCALITY: South Africa.

RANGE: South Africa northward to the Sudan and Kenya Colony in the east and Angola in the west.

Rana æquiplicata Werner

Rana mascareniensis var. *æquiplicata* Werner, 1898, Verh. Zool.-Bot. Ges. Wien, XLVIII, p. 192.

Rana æquiplicata Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 437.

TYPE LOCALITIES: Victoria and Buea, Cameroon.

RANGE: Rain Forest as far west as Cameroon; recorded also from the Transvaal (Mocquard, 1906) but probably through error.

Rana albolabris Hallowell

Rana albolabris Hallowell, 1856, Proc. Acad. Nat. Sci. Phila., VIII, p. 153. Boulenger, 1882, 'Cat. Batr. Sal. Mus.,' p. 59, Pl. v, fig. 2, 2*a* and 2*b*.

TYPE LOCALITY: West Africa.

RANGE: Rain Forest and surrounding territory: Lower Congo, Lake Region, Uele District, and French Guinea.

Rana angolensis Bocage

Rana angolensis Bocage, 1866, Jorn. Sci. Lisboa, I, p. 73. Boulenger, 1918, Trans. Roy. Soc. S. Africa, VII, part 2, p. 131.

TYPE LOCALITY: Duque de Bragança, Angola.

RANGE: Eastern parts of Cape Province, northward to Portuguese East Africa, Nyasaland, and Angola.

Rana ansorgii Boulenger

Rana ansorgii Boulenger, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 107, Pl. IV, fig. 1.

TYPE LOCALITY: Between Benguella and Bihé, Angola.

RANGE: Angola to Cameroon.

Rana beccarii Boulenger

Rana beccarii Boulenger, 1911, Ann. Mus. Stor. Nat., Genova, (3) V, p. 160.

TYPE LOCALITY: Filfil, Eritrea.

RANGE: Eritrea and Abyssinia.

Rana bibronii Hallowell

Rana bibronii Hallowell, 1845, Proc. Acad. Nat. Sci. Phila., II, p. 249.

Type Locality: Liberia.

Range: French Guinea and Liberia to Gaboon.

Rana budgetti Boulenger

Rana budgetti Boulenger, 1903, Ann. Mag. Nat. Hist., (7) XII, p. 555.

Type Locality: MacCarthy Island, Gambia.

Range: Known only from the type locality.

Rana bunoderma Boulenger

Rana bunoderma Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XIX, p. 214.

Type Locality: Caconda, Angola.

Range: Known only from the type locality.

Rana chapini Noble

Rana chapini Noble, 1920, see above, p. 214.

Type Locality: Batama, Belgian Congo.

Range: Known only from the type locality.

Rana christyi Boulenger

Rana christyi Boulenger, 1919, Rev. Zool. Afr., VII, p. 5.

Type Locality: Medje, Belgian Congo.

Range: Ituri forest and Uelé plains.

Rana cordofana (Steindachner)

Pyxicephalus cordofanus Steindachner, 1869, 'Reise Novara, Zool., I, Amph.,' p. 8.
Rana cordofana Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 31.

Type Locality: Kordofan, Egypt.

Range: The Sudan.

Rana crassipes Buchholz and Peters

Rana crassipes Buchholz and Peters, in Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 201.

Type Locality: Abo, Cameroon.

Range: Cameroon-Gaboon area.

Rana cryptotis Boulenger

Rana cryptotis Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 109.

Type Locality: Mossamedes, Angola (Kafitu Swamps and Catequero).

Range: Known only from the type locality.

Rana darlingi Boulenger

Rana darlingi Boulenger, 1902, Proc. Zoöl. Soc. London, II, p. 15, Pl. III, fig. 1.

Type Locality: Mashonaland (Mazoë or between Umtali and Marandellas).

Range: Mashonaland to Victoria Falls, Rhodesia.

Rana delalandii (Duméril and Bibron)

Pyxicephalus delalandii Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 445, Pl. LXXXVII, figs. 1, 1*a*, and 1*b*.
Rana delalandii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 31.

Type Locality: South Africa.

Range: South Africa northward in the east to Eritrea and the Sudan, in the west to Southwest Africa.

Rana elegans Boulenger

Rana elegans Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 59, Pl. v, fig. 1.

Type Locality: "West Africa."

Range: Gaboon.

Rana esculenta ridibunda Pallas

Rana ridibunda Pallas, 1771, 'Reise,' I, p. 458.

Rana esculenta var. *ridibunda* Boulenger, 1897, 'Tailless Batr. Europe,' II, p. 270, Pl. xvii, figs. 100*a*, 101.

Type Locality: Caspian Sea, Volga, and Jaico.

Range: Africa north of the Sahara, western Asia, and all of Europe (except northwestern and central portions and Italy).

Rana fasciata Duméril and Bibron

Rana fasciata Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 389.

Type Locality: Cape of Good Hope.

Range: South Africa north to the Shiré Plateau, Nyasaland.

Rana flavigula (Calabresi)

Pyxicephalus flavigula Calabresi, 1916, Monitore Zool. Ital., XXVII, p. 34, Pl. ii, fig. 1.

Type Locality: Oroflillo, Somaliland.

Range: Known only from the type locality.

Rana floweri Boulenger

Rana floweri Boulenger, 1917, Ann. Mag. Nat. Hist., (8) XX, p. 417.

Type Locality: Roseires on the Blue Nile.

Range: Known only from the type locality.

Rana fülleborni Nieden

Rana fülleborni Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 436.

Type Locality: Crater Lake of N'gosi volcano, Langenburg, Tanganyika Territory.

Range: Known only from the type locality.

Rana fuscigula Duméril and Bibron

Rana fuscigula Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 386. Boulenger, 1918, Trans. Roy. Soc. S. Africa, VIII, part 2, p. 131.

Type Locality: South Africa.

Range: Cape Colony northward to Nyasaland; recorded as far north as Abyssinia and Southwest Africa, but probably due to confusion with closely related species.

Rana galamensis Duméril and Bibron

Rana galamensis Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 367. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 61.

Type Locality: Galam Lakes, Senegal.

Range: Typically the open country from Senegal and the Sudan south to Portuguese East Africa; recorded from the forested regions of Nigeria and Cameroon.

Rana goliath Boulenger

Rana goliath Boulenger, 1906, Ann. Mag. Nat. Hist., (7) XVII, p. 317.

Type Locality: Efulen, Cameroon.

Range: Cameroon.

Rana gondokorensis Werner

Rana gondokorensis Werner, 1907, Sitzber. Akad. Wiss. Wien, CXVI, part 1, pp. 1889 and 1891, Pl. III, fig. 9.

Type Locality: Gondokoro, Anglo-Egyptian Sudan.

Range: Known only from the type locality.

Rana grayii A. Smith

Rana grayii A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. LXXVIII, figs. 2, 2*a*-*c*.

Type Locality: Western districts of Cape Colony.

Range: South Africa north to Transvaal.

Rana guerzea Chabanaud

Rana guerzea Chabanaud, 1920, Bull. Com. Et. Hist. et Scient. A. O. F., p. 493.

Type Localities: N'Zébéla, and N'Zérékore, French Guinea.

Range: Known only from the type localities.

Rana johnstoni Günther

Rana johnstoni Günther, 1893, Proc. Zoöl. Soc. London, p. 620.

Type Locality: Chiromo, Nyasaland.

Range: Nyasaland.

Rana katangae Witte

Rana katangae Witte, 1921, Rev. Zool. Afr., IX, p. 3, Pl. II, figs. 1, 2, 3, and 4.

Type Locality: Lofoi, Katanga.

Range: Known only from the type locality.

Rana lemairei Witte

Rana lemairei Witte, 1921, Rev. Zool. Afr., IX, p. 1, Pl. I.

Type Locality: Lofoi, Katanga.

Range: Known only from the type locality.

Rana leonensis Boulenger

Rana leonensis Boulenger, 1917, Ann. Mag. Nat. Hist., (8) XIX, p. 407; XX, p. 418.

Type Locality: "Sierra Leone," corrected to Bibianaka, Gold Coast.

Range: Known only from the type locality.

Rana longirostris Peters

Rana longirostris Peters, 1870, Monatsber. Akad. Wiss. Berlin, p. 646, Pl. I, fig. 5.

Type Locality: Keta, Gold Coast.

Range: Gold Coast to Gaboon.

Rana macrotympanum (Boulenger)

Pyxicephalus macrotympanum Boulenger, 1912, Ann. Mag. Nat. Hist., (8) X, p. 140.

Rana (Hildebrandtia) macrotympanum Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 33.

Type Locality: West of the Juba River, Gallaland.
Range: Known only from the type locality.

Rana bufonia (Boettger)

Maltzania bufonia Boettger, 1881, Abh. Senck. Ges., XII, p. 418, Pl. I, figs. 3*a*-*e*.
Rana maltzanii Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 34.
Type Locality: Rufisque, Senegal.
Range: Known only from the type locality.

Rana mascareniensis Duméril and Bibron

Rana mascareniensis Duméril and Bibron, 1841, 'Erpét. Gén.,' VIII, p. 350.
Type Localities: Seychelles, Mauritius, and Bourbon.
Range: All of Africa, from Egypt and the Sahara, south to Southwest Africa, Rhodesia, and Zululand.

Rana merumontana Lönnberg

Rana merumontana Lönnberg, 1910, in Sjöstedt, 'Kilimandjaro-Merù Exp.,' I, part 4, p. 21, Pl. I, figs. 4*a* and 4*b*.
Type Locality: Meru.
Range: Known only from the type locality.

Rana moeruensis Boulenger

Rana moeruensis Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 2, Pl. I, fig. 2.
Type Locality: Pweto, Lake Moero.
Range: Known only from the type locality.

Rana miotympanum Boulenger

Rana (*Hildebrandtia*) *miotympanum* Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 34.
Type Locality: Loanda, Angola.
Range: Angola.

Rana natalensis (A. Smith)

Pyxicephalus natalensis A. Smith, 1849, 'Illus. Zool. S. Africa, Rept.,' III, Appendix, p. 23.
Rana natalensis Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 30.
Type Locality: "Country to the eastward of Cape Colony."
Range: Natal to Transvaal.

Rana newtoni Bocage

Rana newtoni Bocage, 1886, Jorn. Sci. Lisboa, XI, p. 73.
Type Locality: S. Thomé.
Range: S. Thomé and Fernando Po.

Rana nutti Boulenger

Rana nutti Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 467; 1909, Trans. Zoöl. Soc. London, XIX, p. 240, Pl. VIII, figs. 1 and 2.
Type Locality: Lake Tanganyika.
Range: Abyssinia southward to Uganda and Tanganyika Territory.

Rana nyassæ Günther

Rana nyassæ Günther, 1892, Proc. Zoöl. Soc. London, p. 558.

Type Locality: Shiré Highlands, Nyasaland.

Range: Nyasaland.

Rana occipitalis Günther

Rana occipitalis Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 130, Pl. xi.

Type Localities: "West Africa," "Africa," Gambia.

Range: Senegal and the Sudan, south to Angola, and Tanganyika Territory.

Rana ornata (Peters)

Pyxicephalus ornatus Peters, 1878, Monatsber. Akad. Wiss. Berlin, p. 207, Pl. ii, fig. 7.

Rana ornata Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 33.

Type Locality: Taita, Kenya Colony.

Range: Somaliland to Portuguese East Africa.

Rana ornatissima Bocage

Rana ornatissima Bocage, 1879, Jorn. Sci. Lisboa, (1) VII, p. 98.

Rana (Hildebrandtia) ornatissima Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, p. 34.

Type Locality: Bihé, Angola.

Range: Uelé Region, south through the savannahs, to Angola and Southern Rhodesia.

Rana oxyrhynchus A. Smith

Rana oxyrhynchus A. Smith, 1849, 'Illus. Zoöl. S. Africa,' III, Pl. lxxvii, figs. 2 and 2*a-c*.

Type Locality: Kafirland and region of Port Natal.

Range: Eritrea, Uelé Region, and Portuguese Guinea, southward throughout Africa.

Rana perpalmata Witte

Rana perpalmata Witte, 1922, Rev. Zool. Afr., X, p. 320.

Type Locality: Chiloango Basin, Lower Congo.

Range: Known only from the type locality.

Rana pulchra Boulenger

Rana pulchra Boulenger, 1896, Ann. Mag. Nat. Hist., (6) XVIII, p. 468.

Type Locality: Lake Tanganyika.

Range: Known only from the type locality.

Rana pumilio Boulenger

Rana pumilio Boulenger, 1920, Ann. Mag. Nat. Hist., (9) VI, p. 106.

Type Locality: Medine, Senegal.

Range: Known only from the type locality.

Rana ruddi Boulenger

Rana ruddi Boulenger, 1907, Proc. Zoöl. Soc. London, II, p. 480, Pl. xxii, fig. 1.

Rana (Hildebrandtia) ruddi Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 36.

Type Locality: Beira, Portuguese East Africa.

Range: Known only from the type locality.

Rana schillukorum Werner

Rana schillukorum Werner, 1907, Sitzber. Akad. Wiss. Wien, CXVI, part 1, pp. 1889 and 1890, Pl. III, fig. 10.

TYPE LOCALITY: Khor Attar, Sudan.

RANGE: Known only from the type locality.

Rana stenocephala Boulenger

Rana stenocephala Boulenger, 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 515.

TYPE LOCALITY: Entebbe, Uganda.

RANGE: Uganda.

Rana subsigillata A. Duméril

Rana subsigillata A. Duméril, 1856, Rev. Mag. Zool., p. 560. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 23.

TYPE LOCALITY: Gaboon.

RANGE: French Guinea south to Gaboon.

Rana togoensis Boulenger

Rana (*Hildebrandtia*) *togoensis* Boulenger, 1919, Trans. Roy. Soc. S. Africa, VIII, part 1, p. 34.

TYPE LOCALITY: Mangu, Togo.

RANGE: Togoland.

Rana trinodis Boettger

Rana trinodis Boettger, 1881, Abh. Senck. Ges., XII, p. 414, Pl. I, figs. 2*a-e*. Pfeffer, 1893 (1892), Jahrb. Hamburg. Wiss. Anst., X, part 1, p. 90.

TYPE LOCALITIES: Dakar and Rufisque, Senegal.

RANGE: Senegambia and Kenya Colony southward through the open country to Mozambique.

Rana tuberculosa (Günther)

Pyxicephalus rugosus Günther, 1864, Proc. Zoöl. Soc. London, p. 479, Pl. XXXIII, fig. 1.

Rana tuberculosa Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 30.

TYPE LOCALITY: Pungo Andongo, Angola.

RANGE: Angola.

Rana venusta Werner

Rana venusta Werner, 1907, Sitzber. Akad. Wiss. Wien, CXVI, part 1, pp. 1889 and 1892, Pl. IV, fig. 11.

TYPE LOCALITIES: Mongalla, Lagos, and Entebbe, Victoria Nyanza.

RANGE: Known only from the above localities.

ROTHSCHILDIA

Mocquard, 1905, Bull. Mus. Hist. Nat., Paris, XI, p. 288
TYPE: *kounhiensis*

Rothschildia kounhiensis Mocquard

Rothschildia kounhiensis Mocquard, 1905, Bull. Mus. Hist. Nat., Paris, XI, p. 288.

Type Locality: Ouardji, Valley of Kounhi, Abyssinia.
Range: Known only from the type locality.

SCHOUTEDENELLA

Witte, 1921, Rev. Zool. Africaine, IX, p. 18
Type: *globosa*

Schoutedenella globosa Witte

Schoutedenella globosa Witte, 1921, Rev. Zool. Africaine, IX, p. 18.
Type Locality: Lofoï (Katanga), Belgian Congo.
Range: Known only from the type locality.

SCOTOBLEPS

Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 438, Pl. xxviii, fig. 1
Type: *gabonicus*

Scotobleps gabonicus Boulenger

Scotobleps gabonicus Boulenger, 1900, Proc. Zoöl. Soc. London, II, p. 439, Pl. xxviii, fig. 1.
Type Locality: Benito River, Spanish Guinea.
Range: Cameroon and Spanish Guinea.

Brevicipitidæ

ANHYDROPHRNYE

Hewitt, 1919, Rec. Albany Mus., III, p. 182, Pl. v, text fig.
Type: *rattrayi*

Anhydrophryne rattrayi Hewitt

Anhydrophryne rattrayi Hewitt, 1919, Rec. Albany Mus., III, p. 182, Pl. v, text fig.
Type Locality: Hogsback, Amatola Range, Cape Colony.
Range: Known only from the type locality.

BREVICEPS

Merrem, 1820, 'Tent. Syst. Amph.,' p. 177
Type: *gibbosus*

Breviceps adspersus Peters

Breviceps adspersus Peters, 1882, 'Reise nach Mossambique,' III, p. 177. Boulenger, 1910, Ann. S. African Mus., V, p. 534.
Type Locality: Damaraland and Transvaal.
Range: Southwest Africa, Colony, and Cape Transvaal.

Breviceps gibbosus (Linné)

Rana gibbosa Linné, 1758, 'Syst. Nat.,' 10th Ed., I, p. 211.
Breviceps gibbosus Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 176.
Type Locality: Indefinite.
Range: South Africa north to southern Angola and British Central Africa.

Breviceps macrops Boulenger

Breviceps macrops Boulenger, 1907, Ann. Mag. Nat. Hist., (7) XX, p. 46, fig. and Pl. II.

Type Locality: Namaqualand.

Range: Namaqualand.

Breviceps mossambicus Peters

Breviceps mossambicus Peters, 1855, Arch. Naturg., XXI, part 1, p. 58. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 177.

Type Localities: Island of Mozambique and Sena.

Range: South Africa, north to Angola, Lake Moero, and northern Tanganyika Territory.

Breviceps verrucosus Rapp

Breviceps verrucosus Rapp, 1842, Arch. Naturg., VIII, part 1, p. 291, Pl. VI, fig. 5. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 177.

Type Locality: Natal.

Range: South Africa, north on the east to Uganda.

CACOSTERNUM

Boulenger, 1887, Ann. Mag. Nat. Hist., (5) XX, p. 51
Type: *boettgeri*

Cacosternum boettgeri (Boulenger)

Arthroleptis boettgeri Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 118, Pl. XI, fig. 6.

Cacosternum nanum Boulenger, 1887, Ann. Mag. Nat. Hist., (5) XX, p. 52.

Cacosternum boettgeri Boulenger, 1896, (7) XVII, p. 321.

Type Locality: Vleis, Kaffraria.

Range: Southwest Africa and South Africa, north to Kenya Colony.

CALLULINA

Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 449
Type: *kreffti*

Callulina kreffti Nieden

Callulina kreffti Nieden, 1910, Sitzber. Ges. Naturf. Freunde Berlin, p. 449.

Type Localities: Amani and Tanga, Tanganyika Territory.

Range: Known only from the type localities.

DIDYNAMIPUS

Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 143
Type: *sjöstedti*

Didynamipus sjöstedti Andersson

Didynamipus sjöstedti Andersson, 1903, Verh. Zool.-Bot. Ges. Wien, LIII, p. 143; 1905, Ark. Zool., Stockholm, II, No. 20, p. 24, Pl. I, figs. 3, 3*a*-*d*.

Type Locality: Cameroon.

Range: Cameroon.

HEMISUS

Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 47
TYPE: *guttatum*

Hemisus guttatum (Rapp)

Engystoma guttatum Rapp, 1842, Arch. Naturg., VIII, part 1, p. 290, Pl. VI, figs. 3 and 4.

Hemisus guttatum Günther, 1858, 'Cat. Batr. Sal. Brit. Mus.,' p. 47. Boulenger, 1910, Ann. S. African Mus., V, p. 535.

TYPE LOCALITY: Natal.

RANGE: South Africa north to southern Angola and Zululand.

Hemisus marmoratum (Peters)

Engystoma marmoratum Peters, 1855, Arch. Naturg., XXI, part 1, p. 58.

Hemisus marmoratus Peters, 1882, 'Reise nach Mossambique,' III, p. 173, Pl. XXV, fig. 1; Pl. XXVI, figs. 10, 10*a*, and 10*b*.

Hemisus marmoratum Boulenger, 1910, Ann. S. African Mus., V, p. 535.

TYPE LOCALITY: Cabaçeira, Portuguese East Africa.

RANGE: Gambia and Egypt, south to southern Rhodesia; practically absent from the forest, but occurring to the north and south of it.

PHRYNOMANTIS

Peters, 1867, Monatsber. Akad. Wiss. Berlin, p. 35
TYPE: *fusca*

Phrynomantis affinis Boulenger

Phrynomantis affinis Boulenger, 1901, Ann. Mus. Congo, (1) II, fasc. 1, p. 6, Pl. II, figs. 5-5*d*.

TYPE LOCALITY: Pweto, Lake Moero.

RANGE: Known only from the type locality.

Phrynomantis annectens Werner

Phrynomantis annectens Werner, 1910, in Schultze, Denkschr. Med. Naturw. Ges. Jena, XVI, p. 294. Hewitt, 1911, Ann. Transvaal Mus., III, part 1, p. 54.

TYPE LOCALITY: Aar River, Cape Colony.

RANGE: Known only from the type locality.

Phrynomantis bifasciata (Smith)

Brachymerus bifasciatus Smith, 1849, 'Illus. Zool. S. Africa,' III, Pl. LXIII.

Phrynomantis bifasciata Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 172.

TYPE LOCALITY: "Country to the east and northeast of the Cape Colony."

RANGE: South Africa northward to Angola in the west, to northern Kenya Colony in the east.

Phrynomantis microps Peters

Phrynomantis microps Peters, 1875, Monatsber. Akad. Wiss. Berlin, p. 210, Pl. III, fig. 6. Boulenger, 1882, 'Cat. Batr. Sal. Brit. Mus.,' p. 173.

Type Locality: Accra, Gold Coast.

Range: Gold Coast eastward through the Sudan, possibly reaching Tanganyika Territory.

Phrynomantis nasuta Methuen and Hewitt

Phrynomantis nasuta Methuen and Hewitt, 1914, Ann. Transvaal Mus., IV, p. 122.

Type Locality: Kraiklooft, Southwest Africa.

Range: Known only from the type locality.

PLATES XXIII TO XLII

PLATE XXIII

Hymenochirus curtipes, new species, type.

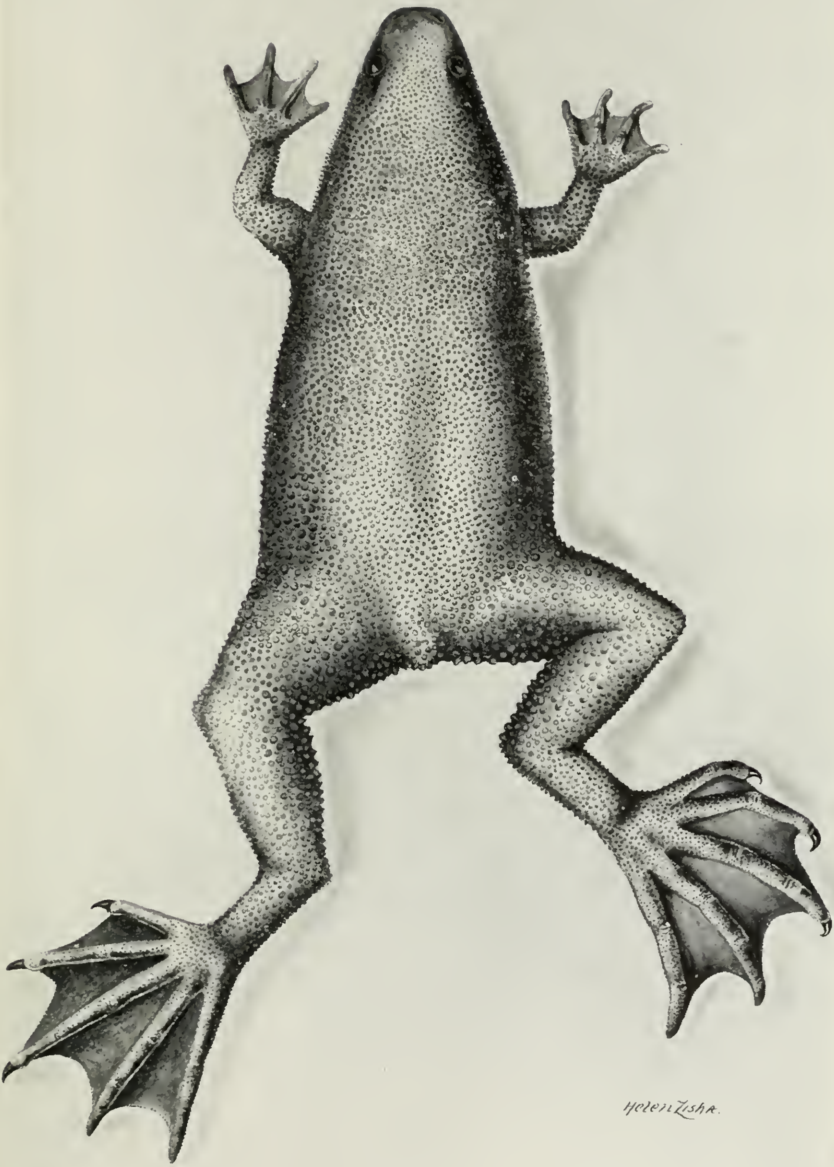
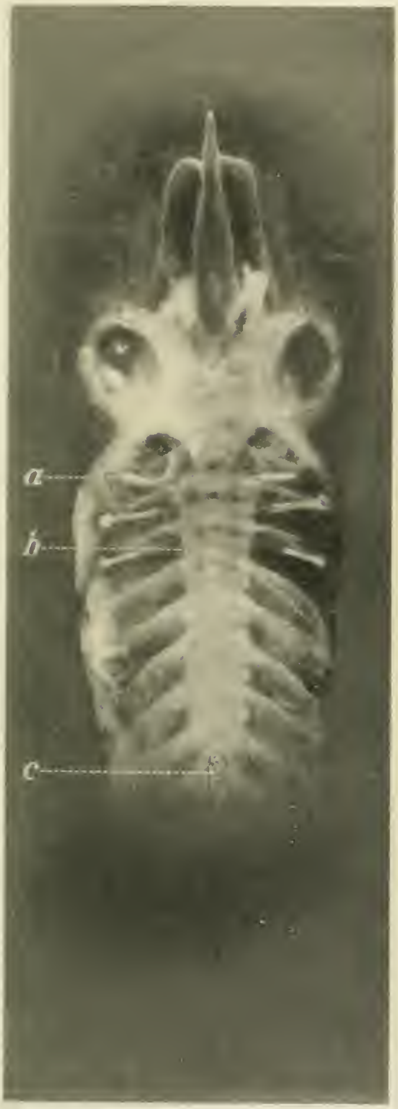

Helen Ziska.

PLATE XXIV

Xenopus mülleri (Peters), larvæ, ventral aspect. Two stages in development of ribs. Larva in Fig. 1, 57 mm. in total length, in Fig. 2, 67 mm.

a, ribs; *b*, notochord (the hypochordal cartilage is not visible); *c*, coccyx; d, connective tissue capsule for anterior lobe of lung; *e*, sacral diapophyses.



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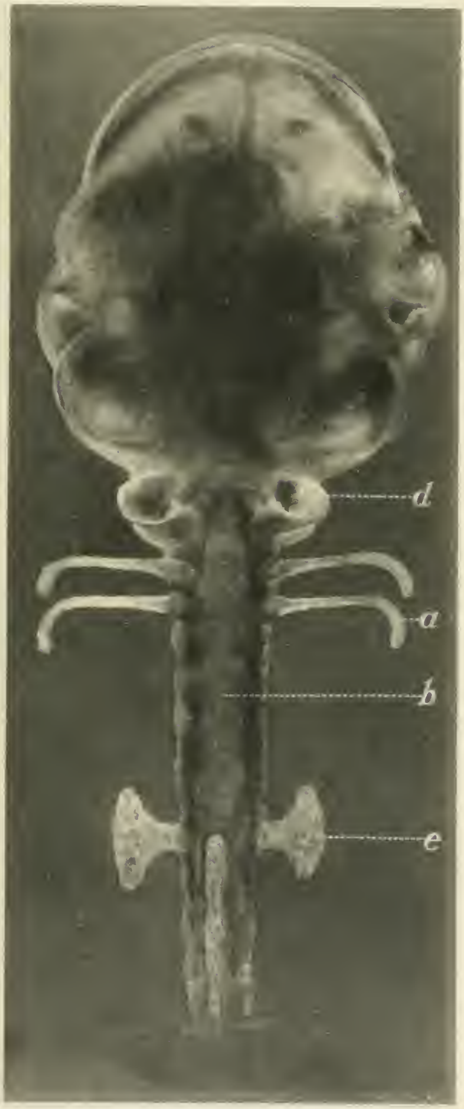

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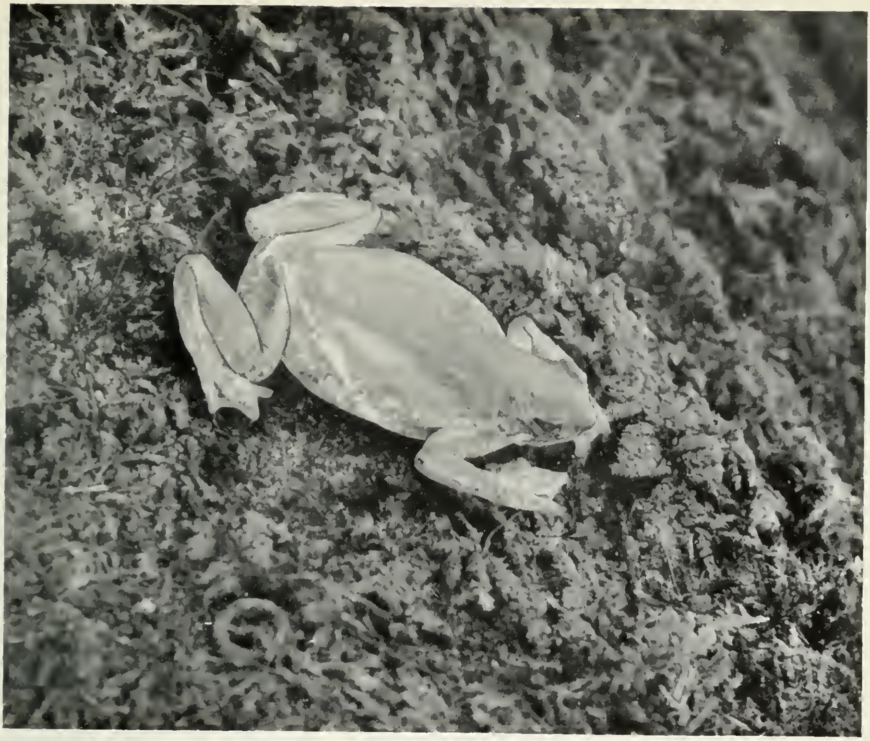
Plate XXV

Fig. 1. *Nectophryne afra* Buchholz and Peters (dead specimen). Fig. 2. *Bufo superciliaris* Boulenger.



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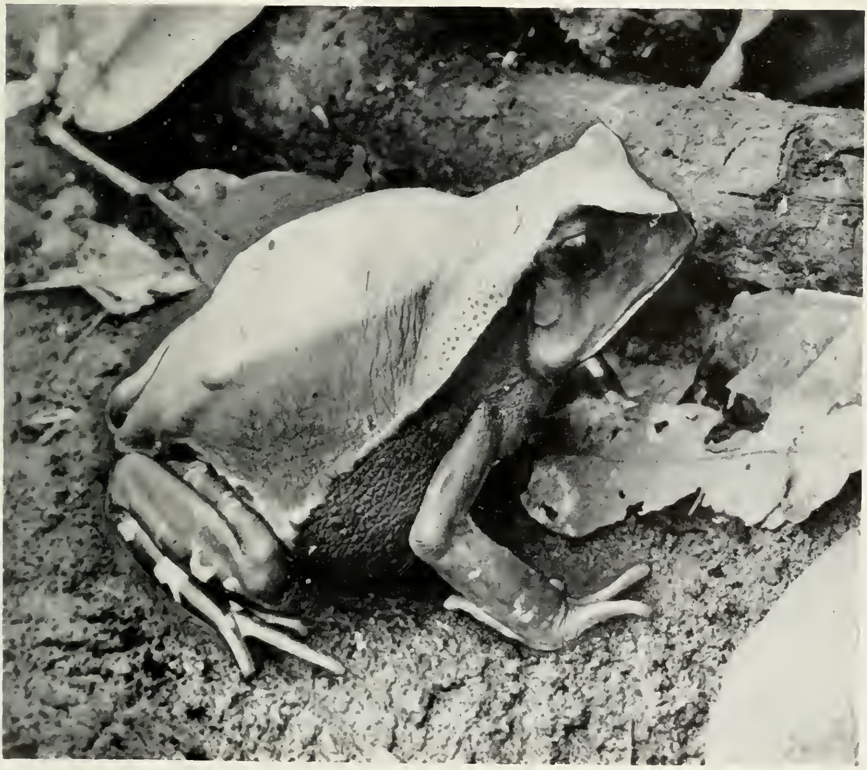

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PLATE XXVI

Fig. 1. *Kassina senegalensis* (Duméril and Bibron), digit showing T-shaped terminal phalanx and intercalary bone. Fig. 2. *Rana christyi* Boulenger, third and fourth digits of foot, the former with exposed terminal phalanx in its capsule of connective tissue. Fig. 3. *Nectophryne guentheri* Boulenger, terminal phalanx. Fig. 4. *Nectophryne afra* Buchholz and Peters, left hand, ventral aspect, showing both the form of the terminal phalanges and extent of the digital lamellæ.

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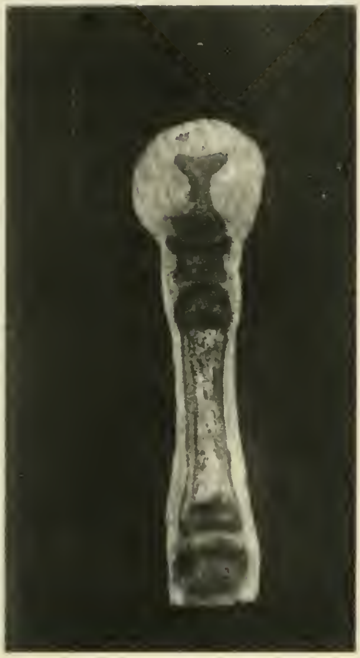

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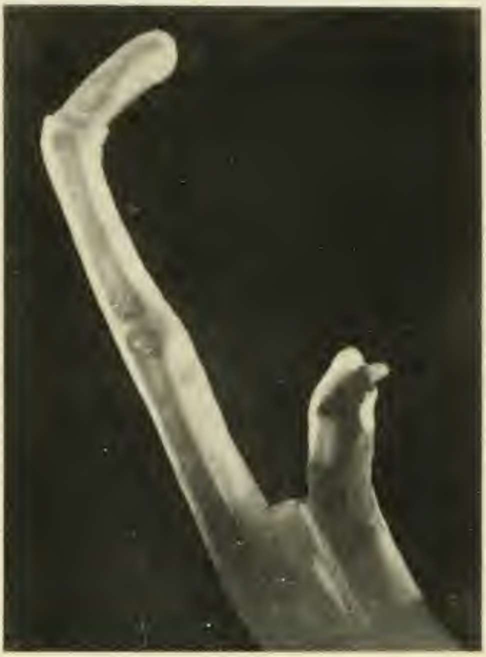

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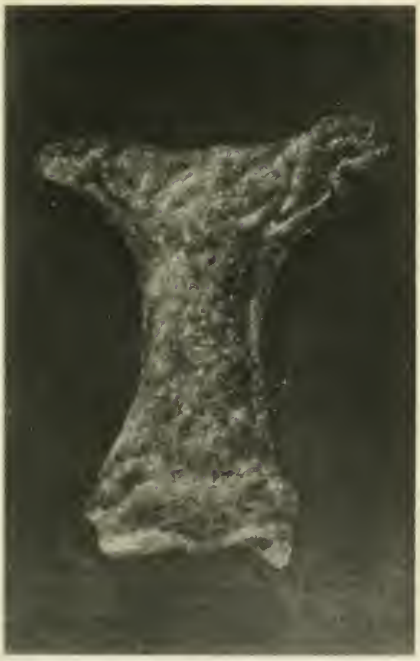

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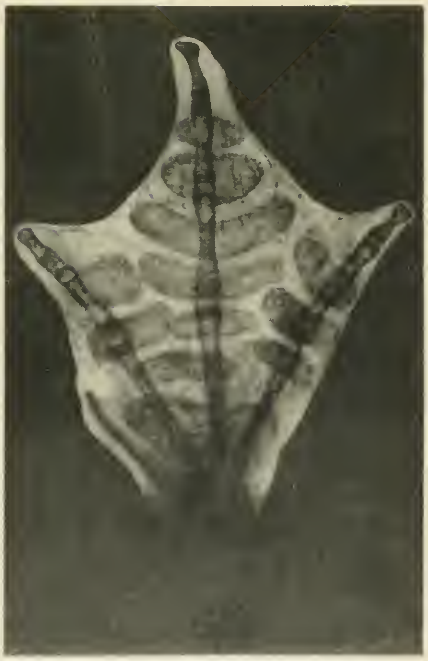
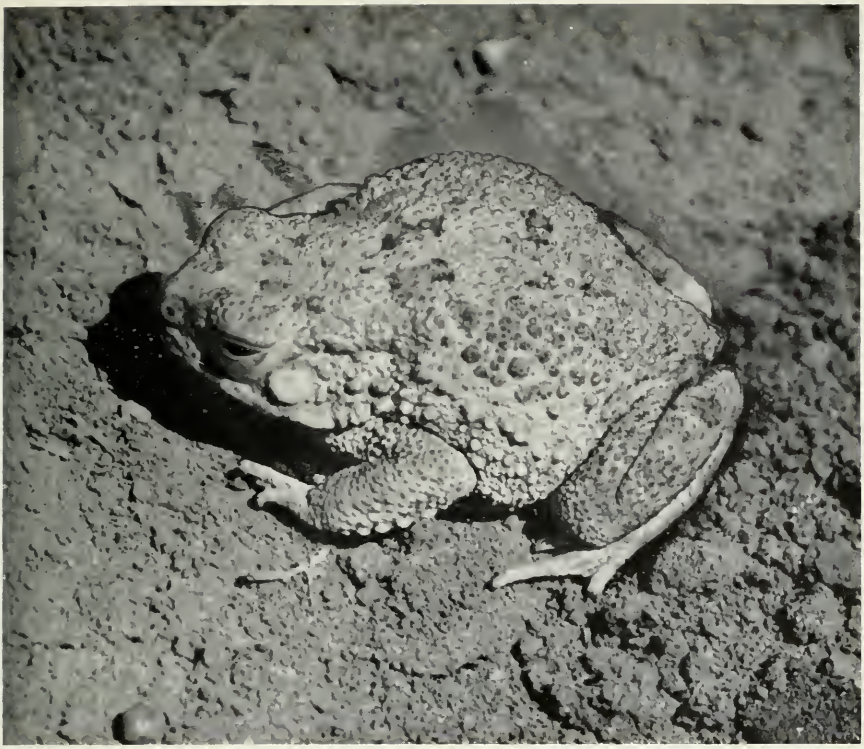


Plate XXVII

Bufo regularis Reuss. Fig. 1, ♂; Fig. 2, ♀.



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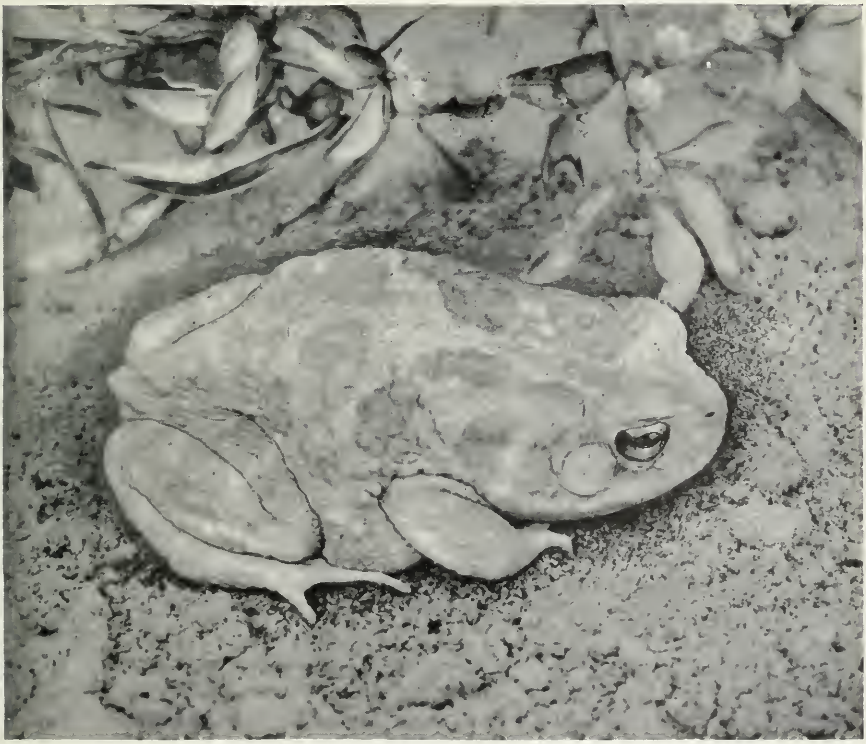

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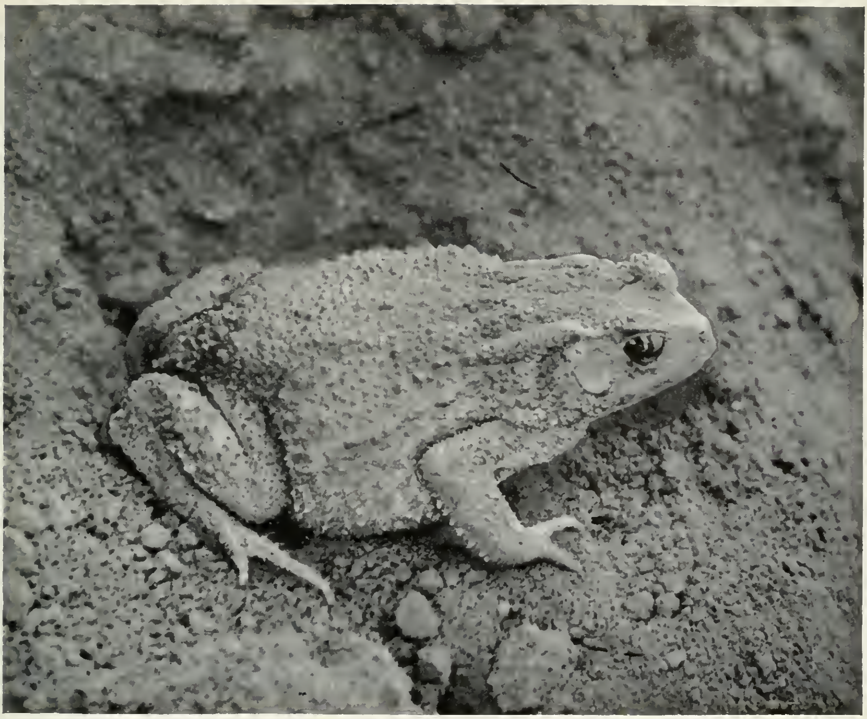
Plate XXVIII

Fig. 1. *Bufo funereus* Bocage.
Fig. 2. *Bufo polycercus* Werner.



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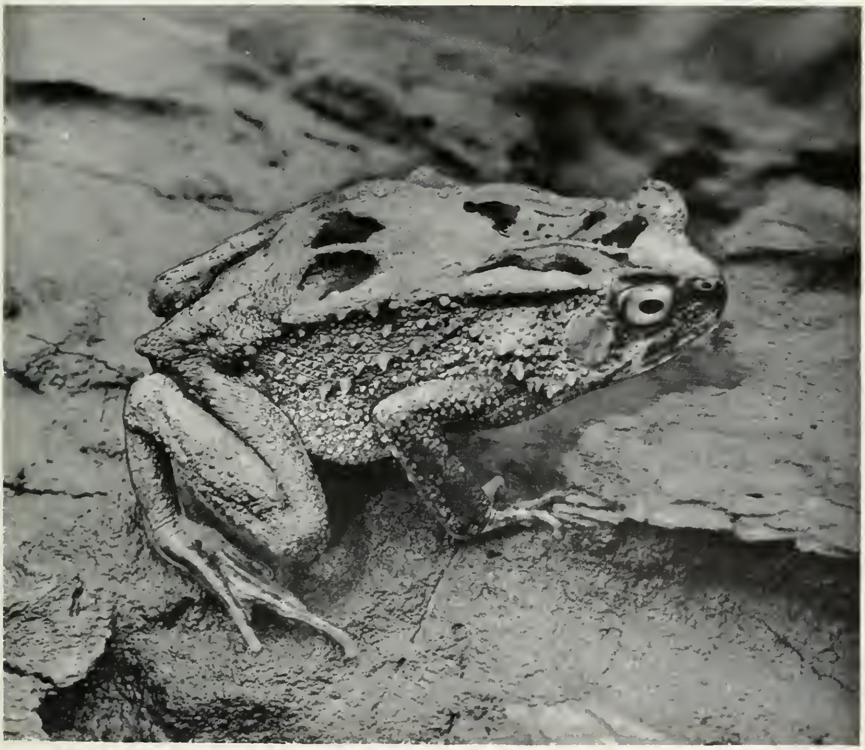

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PLATE XXIX

Ventral Aspect of Pectoral Girdles.

Fig. 1. *Arthroleptis wahlbergi* Smith.
Fig. 2. *Arthroleptis batesii* Boulenger.
Fig. 3. *Arthroleptis feæ* Boulenger.
Fig. 4. *Phrynobatrachus perpalmatus* (Boulenger).
Fig. 5. *Arthroleptis variabilis* Matschie.
Fig. 6. *Phrynobatrachus dendrobates* (Boulenger).
Fig. 7. *Arthroleptis xenodactylus* Boulenger.
Fig. 8. *Phrynobatrachus bonebergi* (Hewitt and Methuen).

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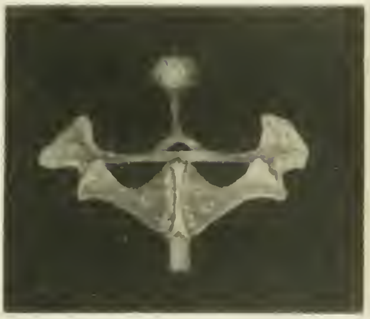

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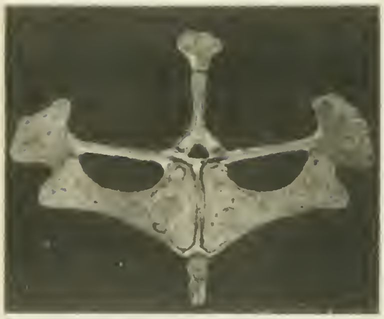

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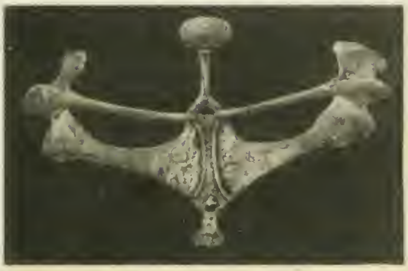

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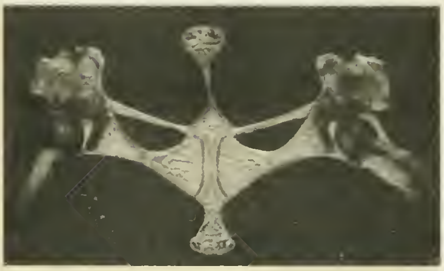

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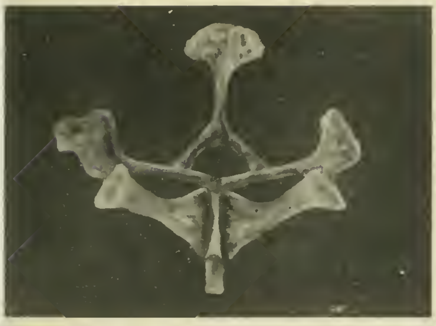

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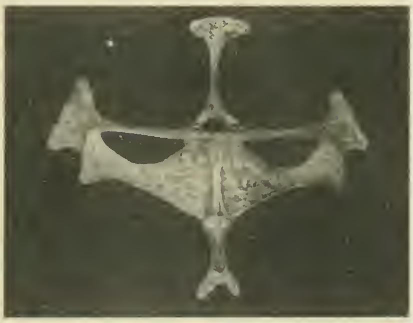

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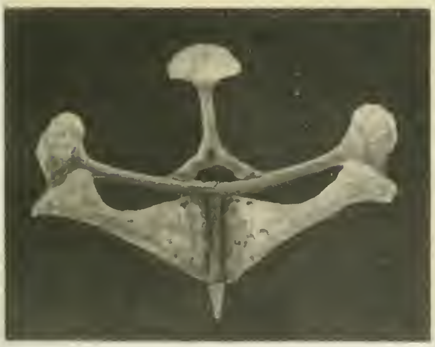

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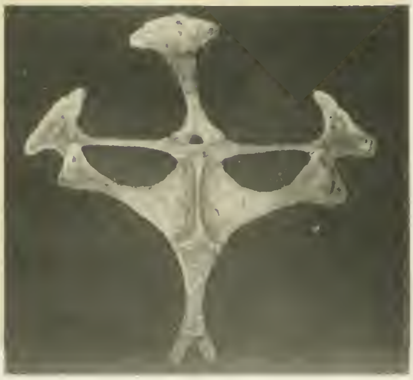


Plate XXX

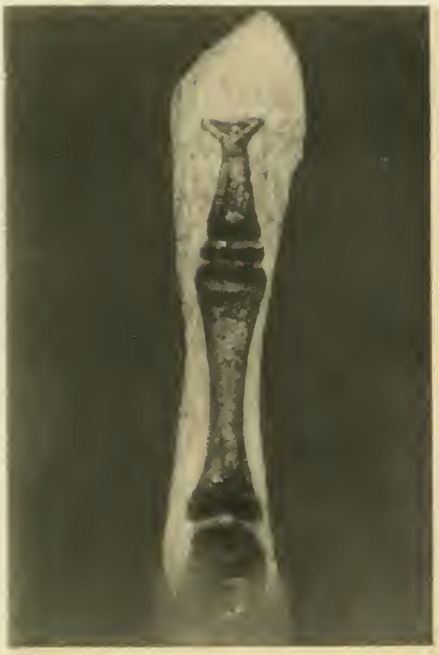
Fig. 1. *Arthroleptis variabilis* Matschie, maximum expansion of terminal phalanx.

Fig. 2. *Phrynobatrachus perpalmatus* (Boulenger), maximum expansion of terminal phalanx.

Fig. 3. *Arthroleptis variabilis* Matschie, left hand, dorsal aspect.

Fig. 4. *Phrynobatrachus dendrobates* (Boulenger), left hand, dorsal aspect.

1



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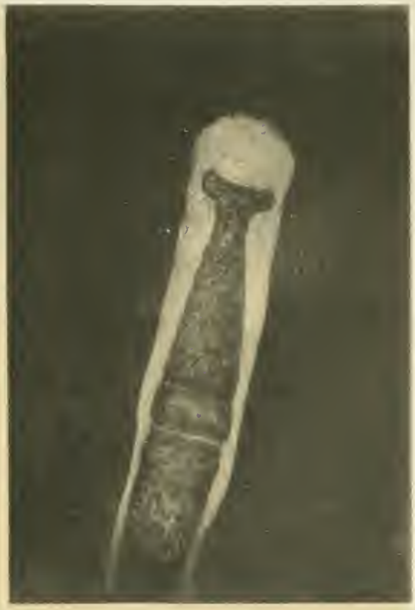

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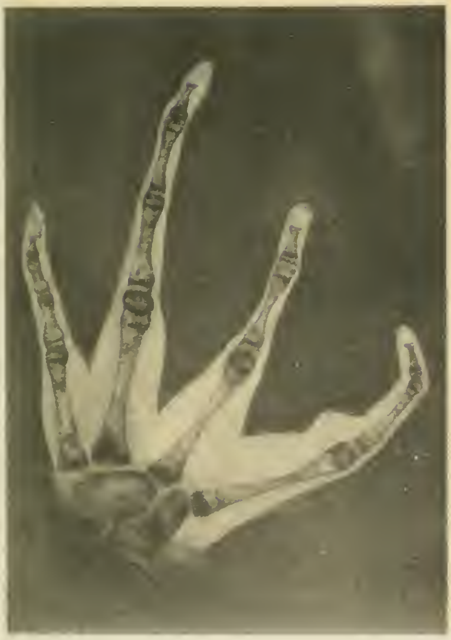

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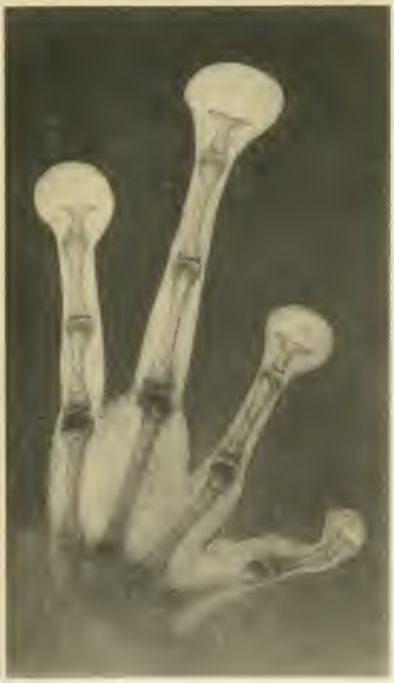
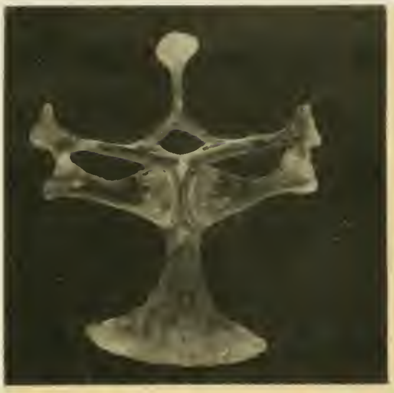


Plate XXXI

Ventral Aspect of Pectoral Girdles.

Fig. 1. *Hylambates verrucosus* Boulenger.
Fig. 2. *Hylambates greshoffi* Schilthuis.
Fig. 3. *Leptopelis calcaratus* (Boulenger).
Fig. 4. *Leptopelis anchietæ* (Bocage).
Fig. 5. *Leptopelis aubryi* (Werner).
Fig. 6. *Leptopelis brevirostris* (A. Duméril).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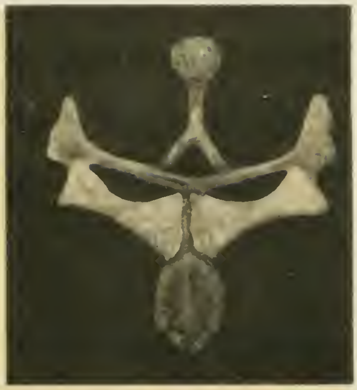
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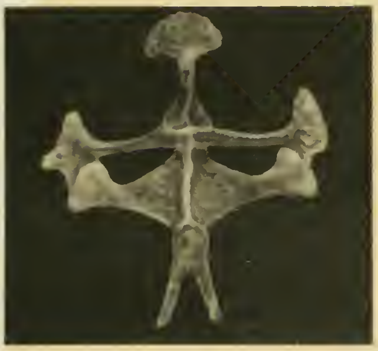
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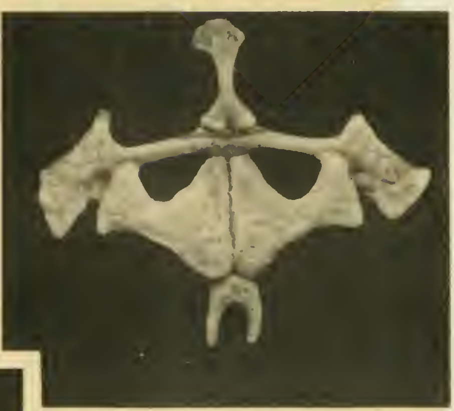
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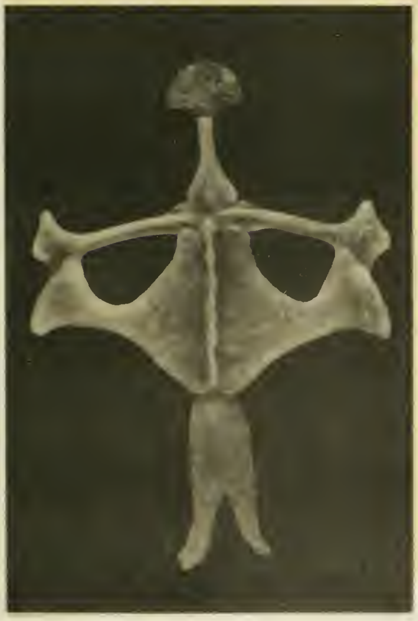
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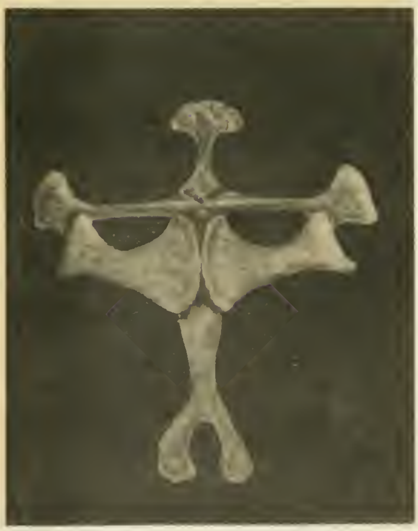
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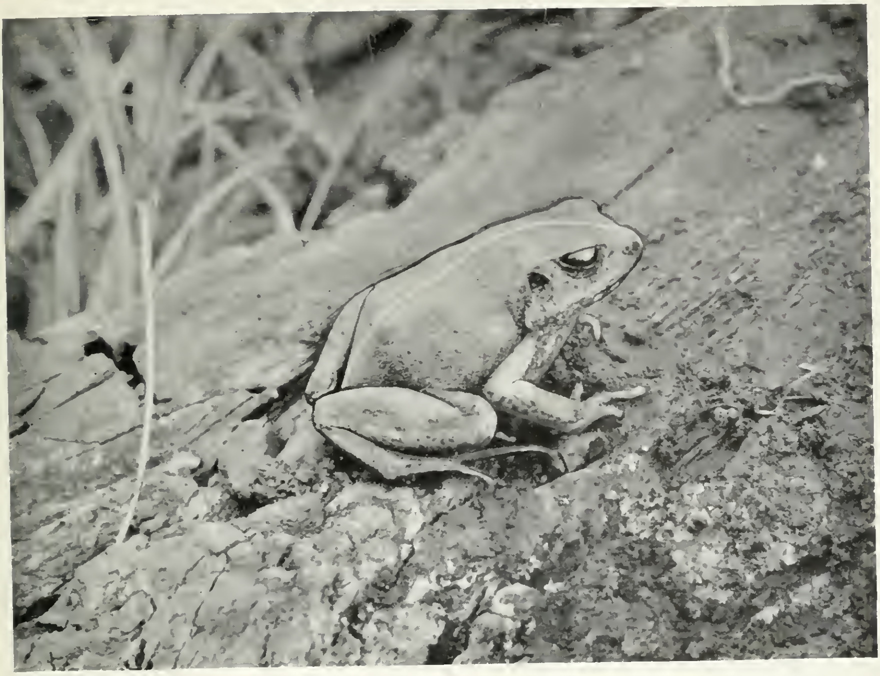
PLATE XXXII

Fig. 1. *Arthroleptis variabilis* Matschie.
Fig. 2. *Cardioglossa leucomystax* (Boulenger).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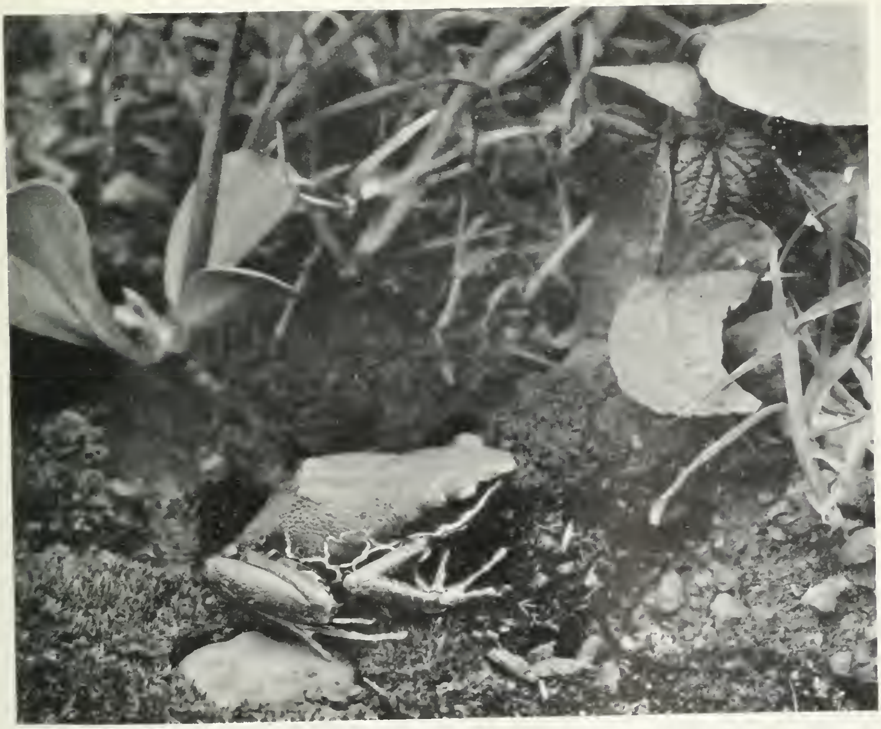
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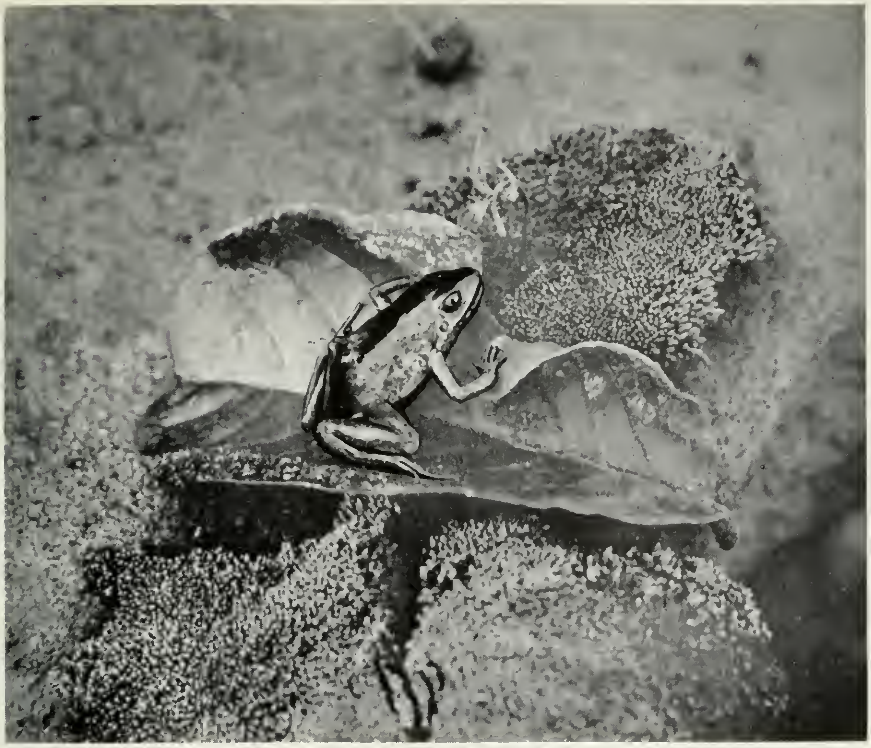
PLATE XXXIII

Fig. 1. *Phrynobatrachus natalensis* (A. Smith).
Fig. 2. *Rana ornatissima* Bocage.



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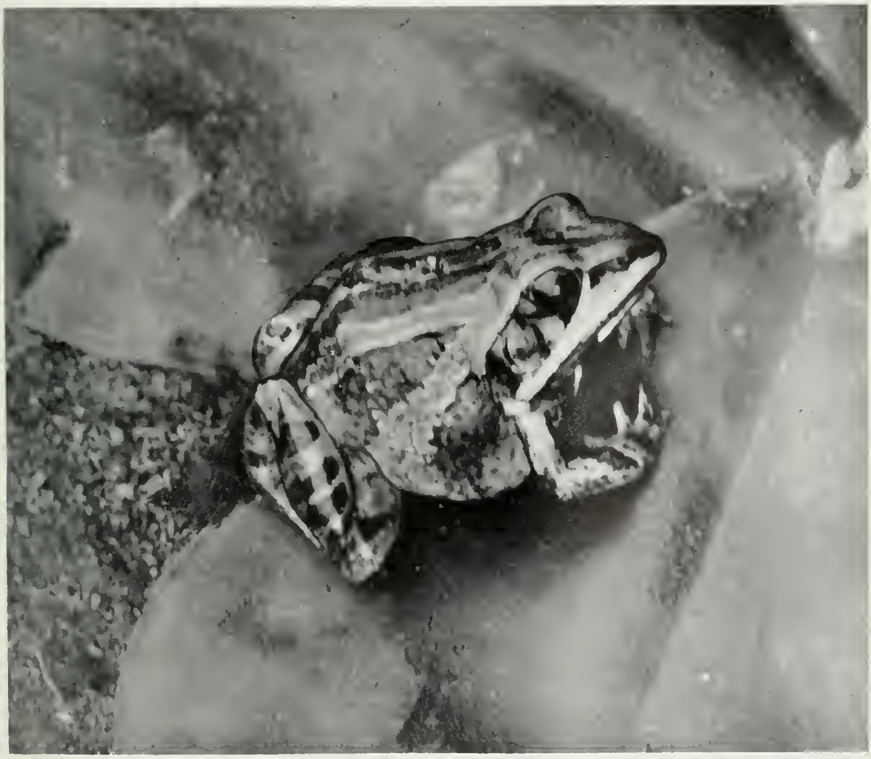

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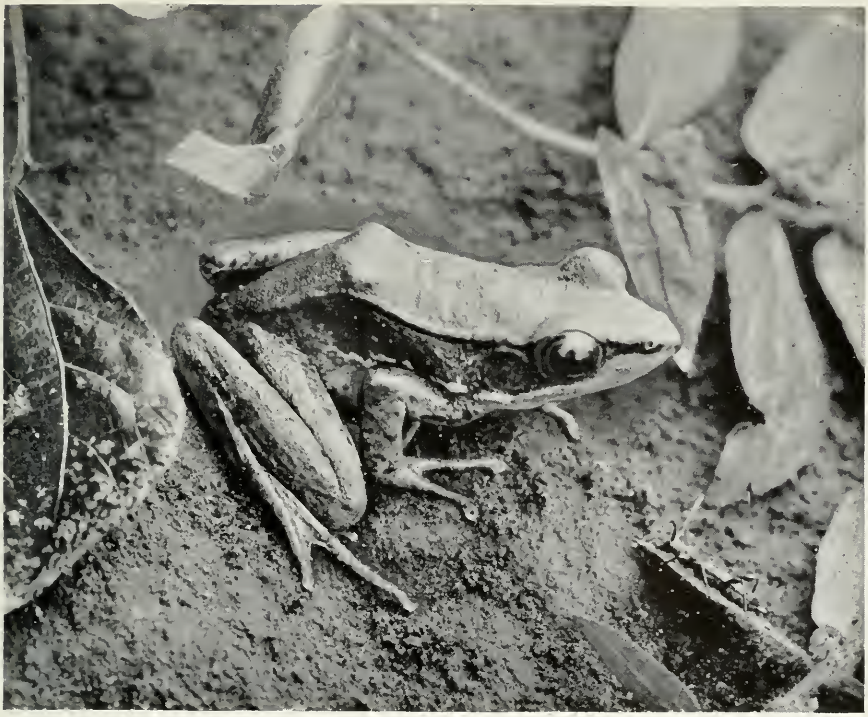
Plate XXXIV

Fig. 1. *Rana albolabris* Hallowell.
Fig. 2. *Rana occipitalis* Günther.



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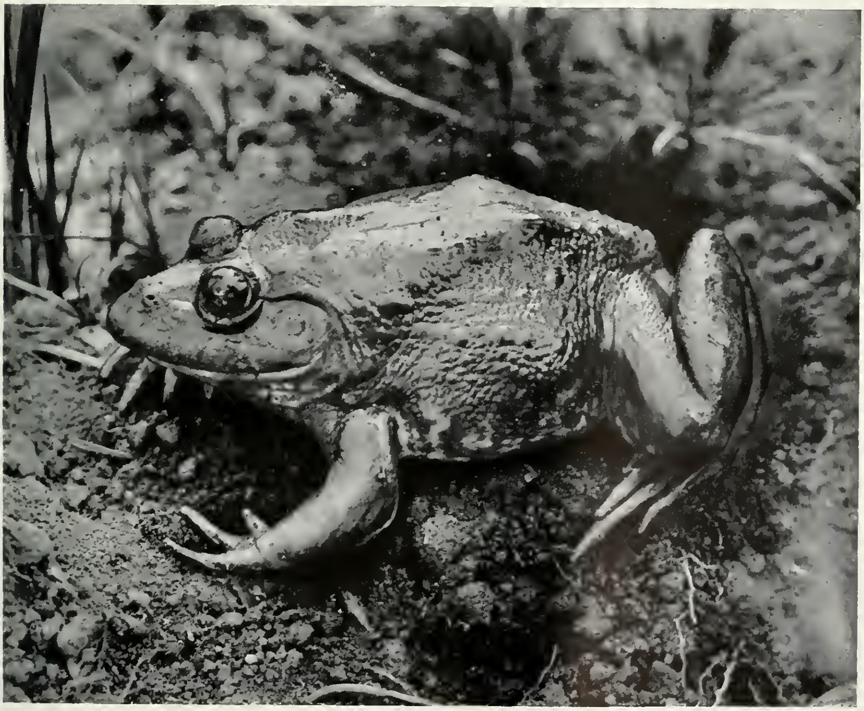

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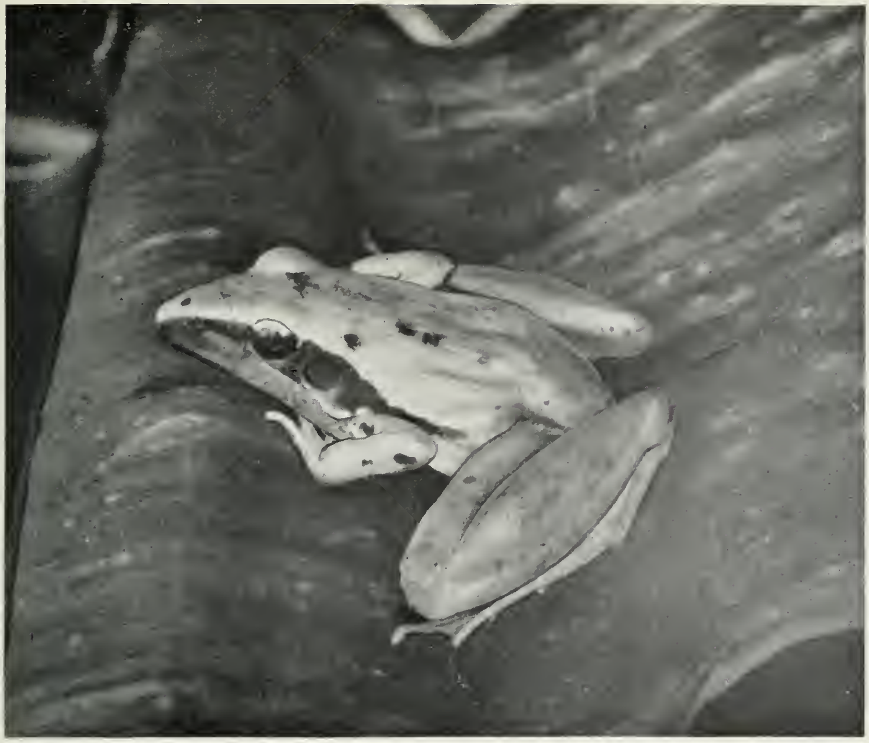
PLATE XXXV

Fig. 1. *Rana christyi* Boulenger.
Fig. 2. *Rana oxyrhynchus* A. Smith.



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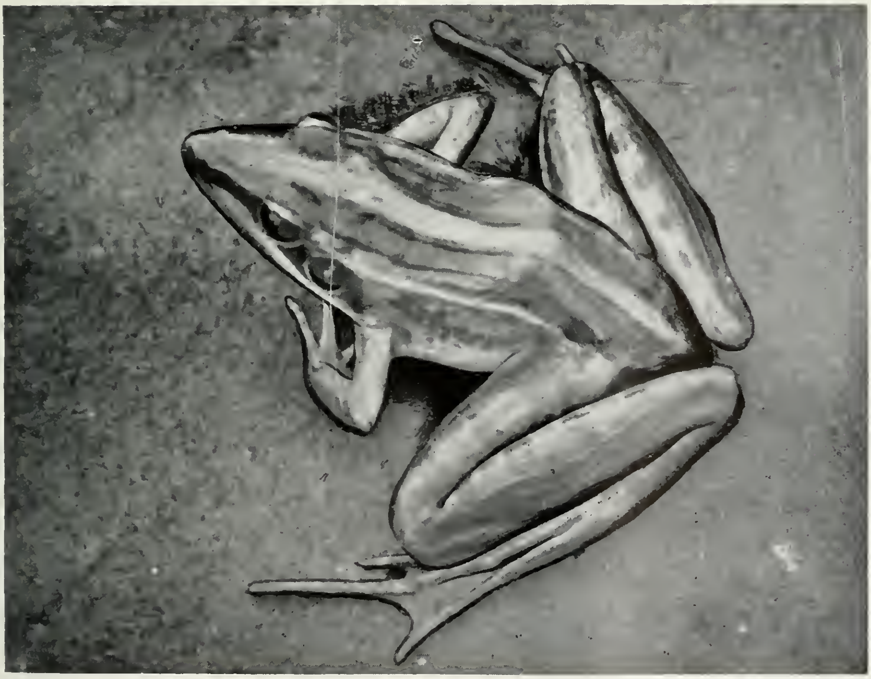

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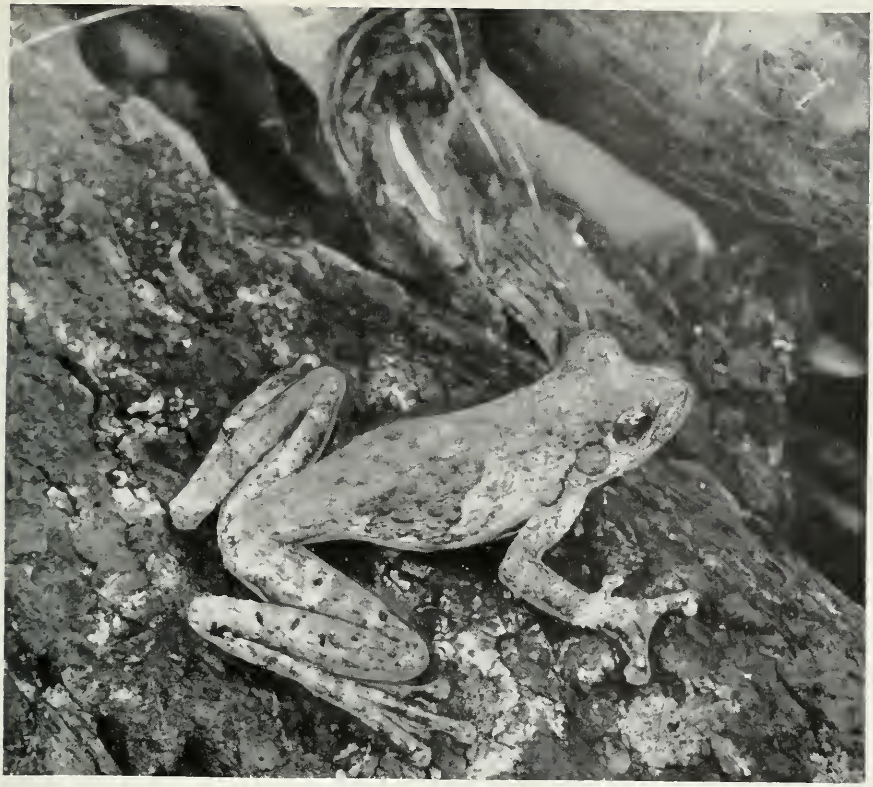
PLATE XXXVI

Fig. 1. *Chiromantis rufescens* (Günther).

Fig. 2. Two types of "nest" of *C. rufescens* (Günther); the first on the trunk of a tree, and the second on low hanging leaves.



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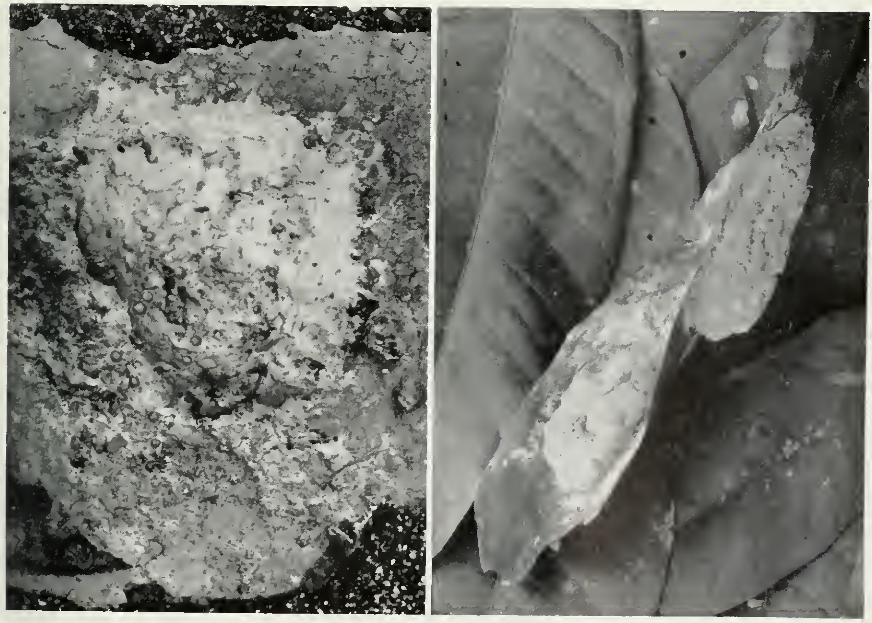

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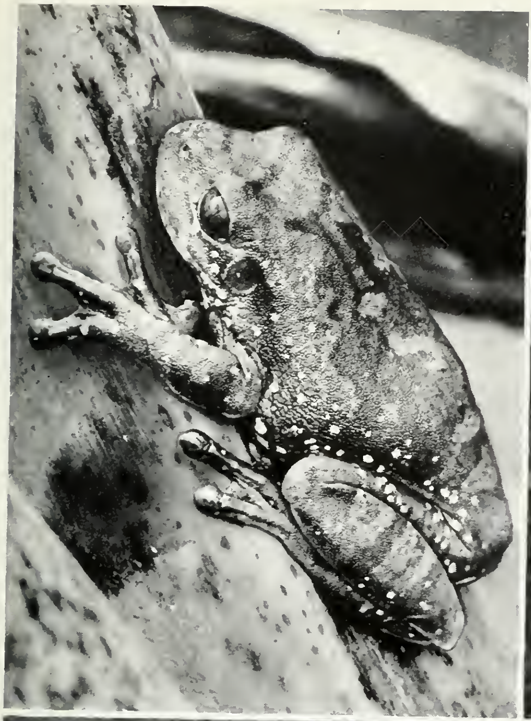
Plate XXXVII

Leptopelis rufus Reichenow, showing both complete and incomplete patterns.

1



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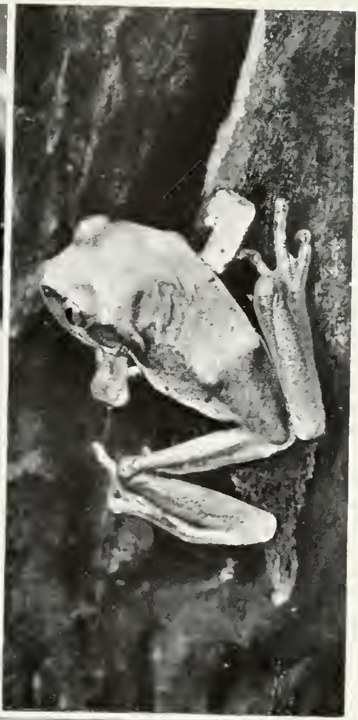

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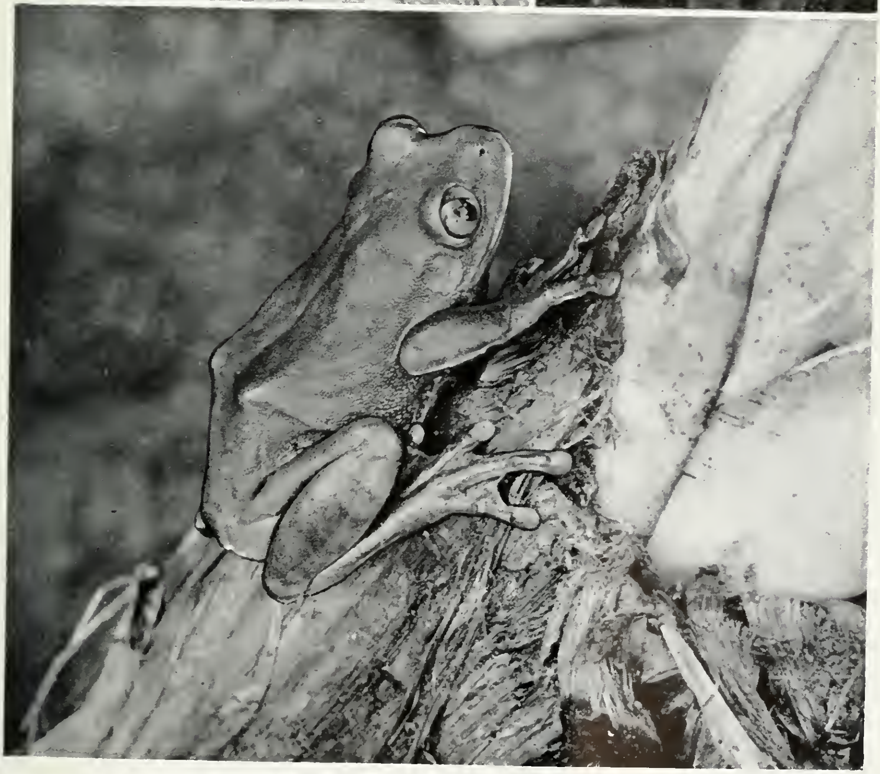

PLATE XXXVIII

Fig. 1. *Leptopelis aubryi* (Werner).
Fig. 2. *Leptopelis anchieta* (Bocage).
Fig. 3. *Hylambates verrucosus* Boulenger.

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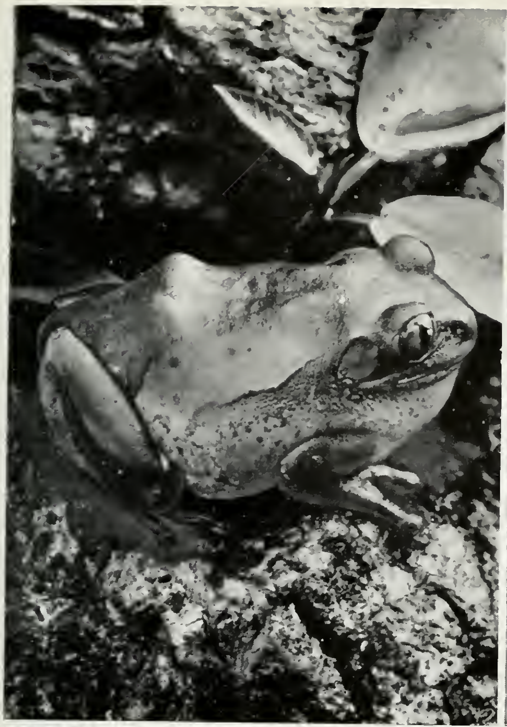

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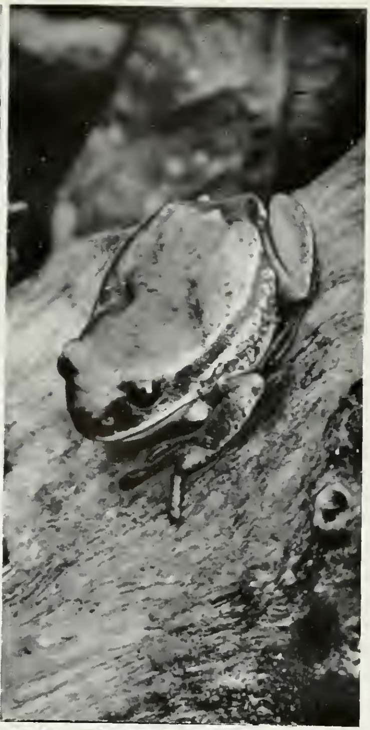

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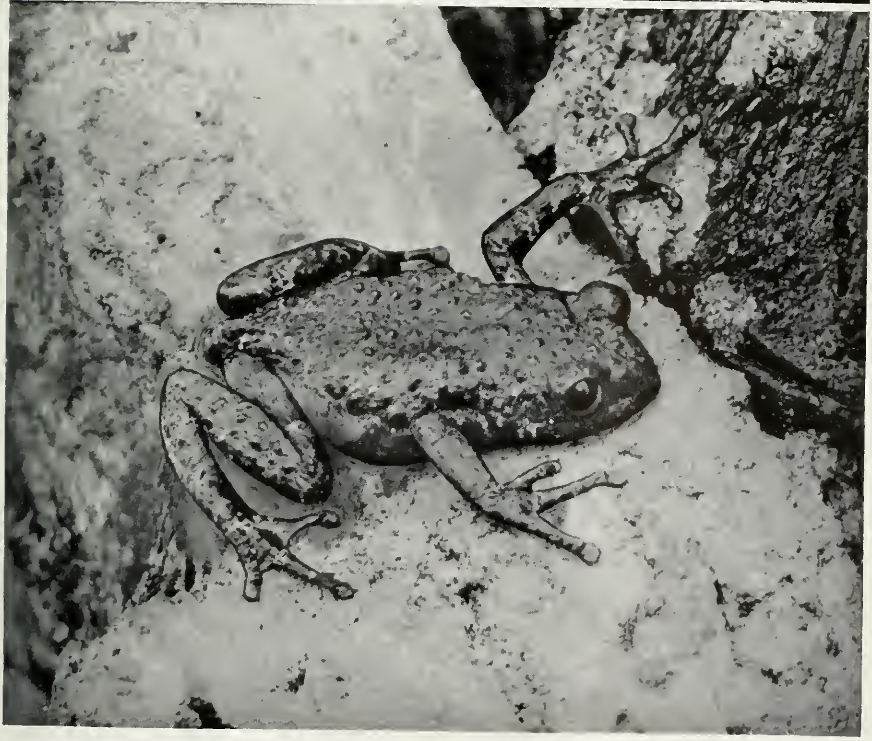

Plate XXXIX

Fig. 1. *Hyperolius langi*, new species.
Fig. 2. *Hyperolius ocellatus* Günther.
Fig. 3. *Hyperolius concolor* (Hallowell).

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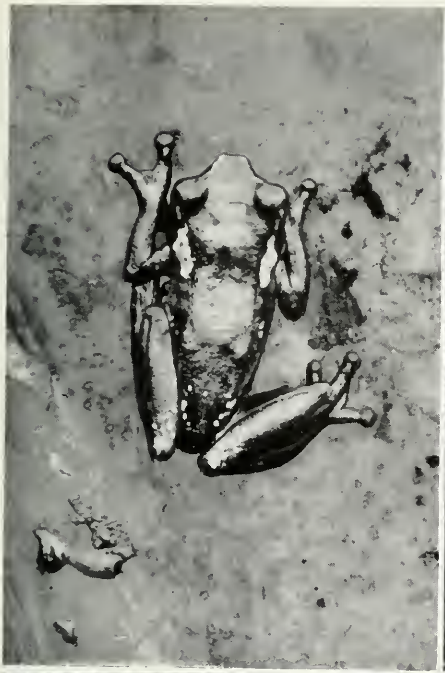

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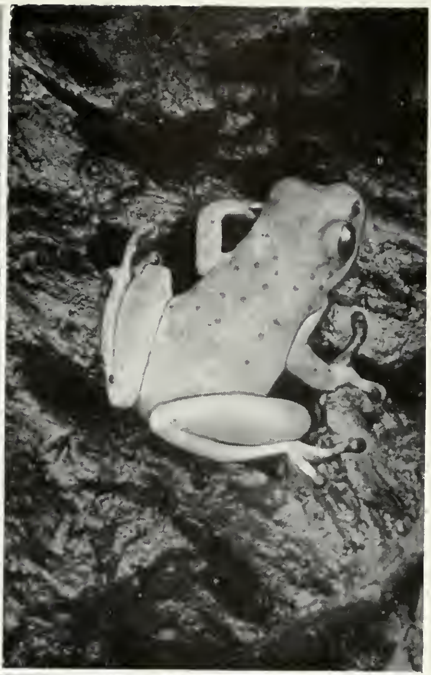

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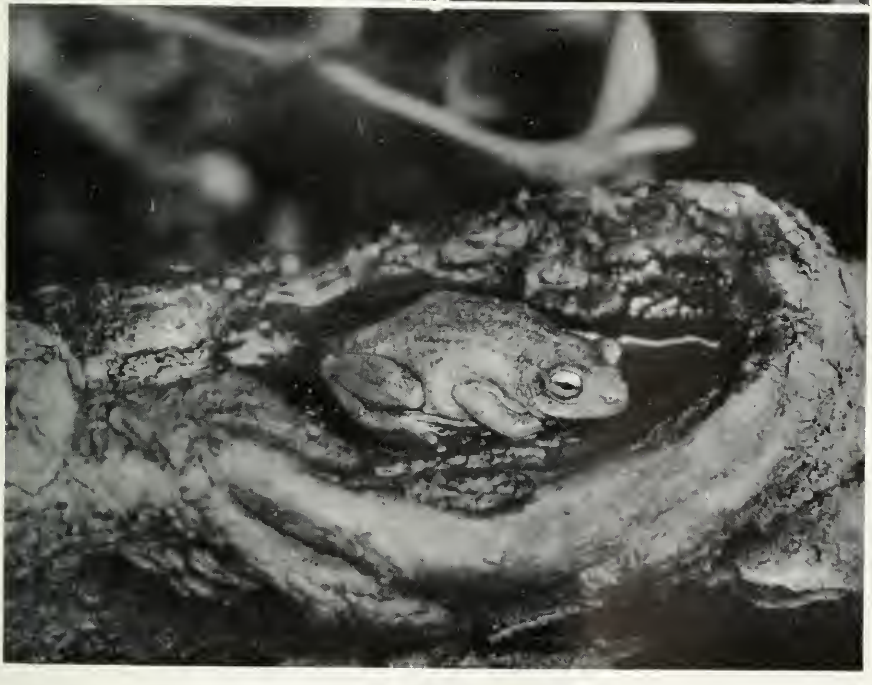
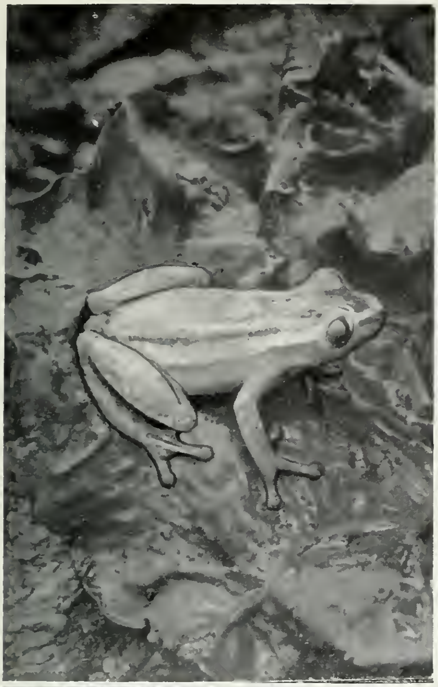


Plate XL

Fig. 1. *Hyperolius pleurotænius* (Boulenger).
Fig. 2. *Hyperolius acutirostris* Buchholz and Peters.
Fig. 3. *Hyperolius picturatus* Peters.

1



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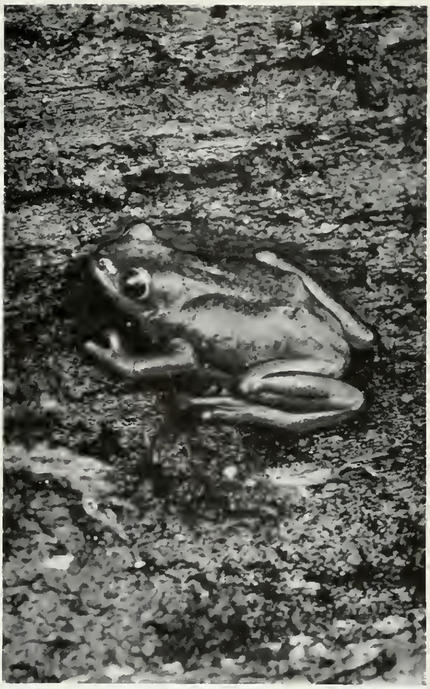

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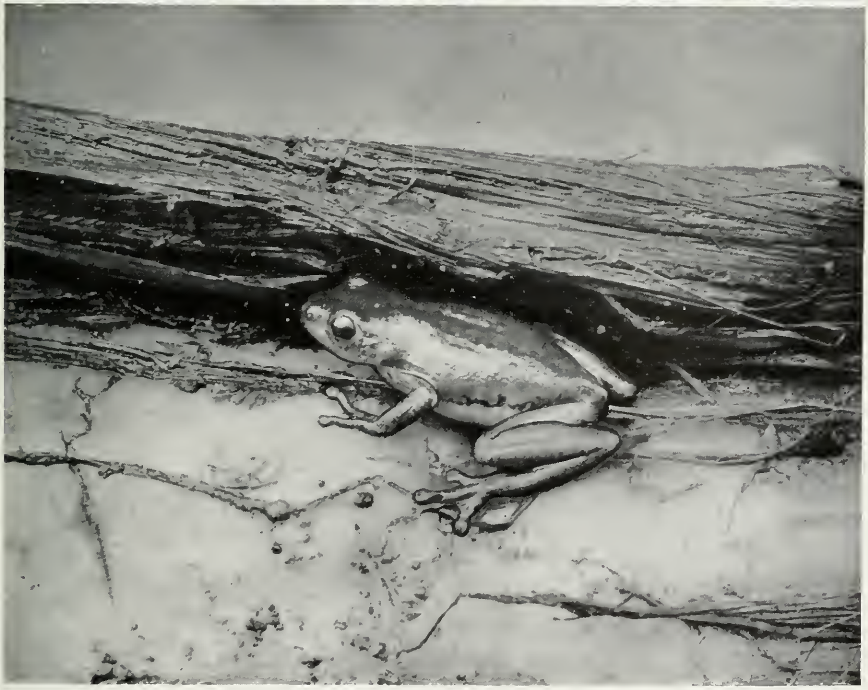
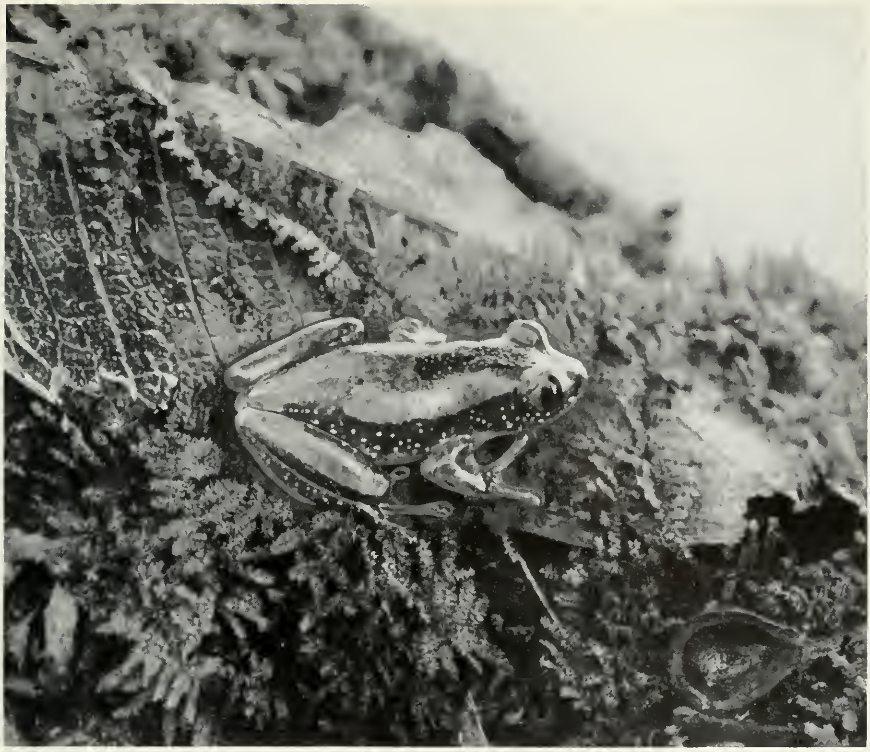


Plate XLI

Fig. 1. *Megalixalus fornasinii* (Bianconi).

Fig. 2. *Megalixalus spinosus* (Buchholz and Peters).



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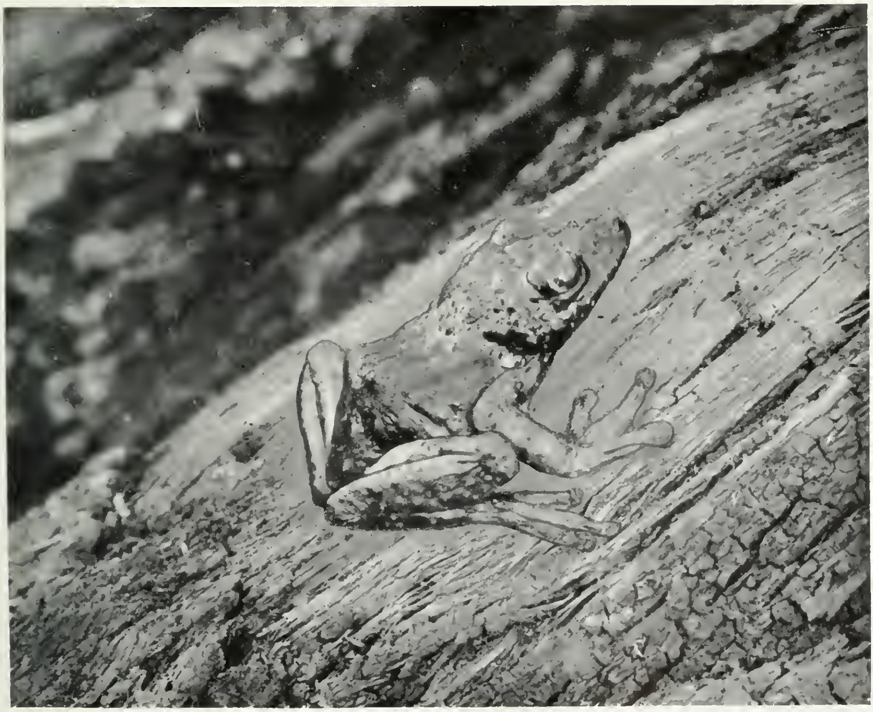

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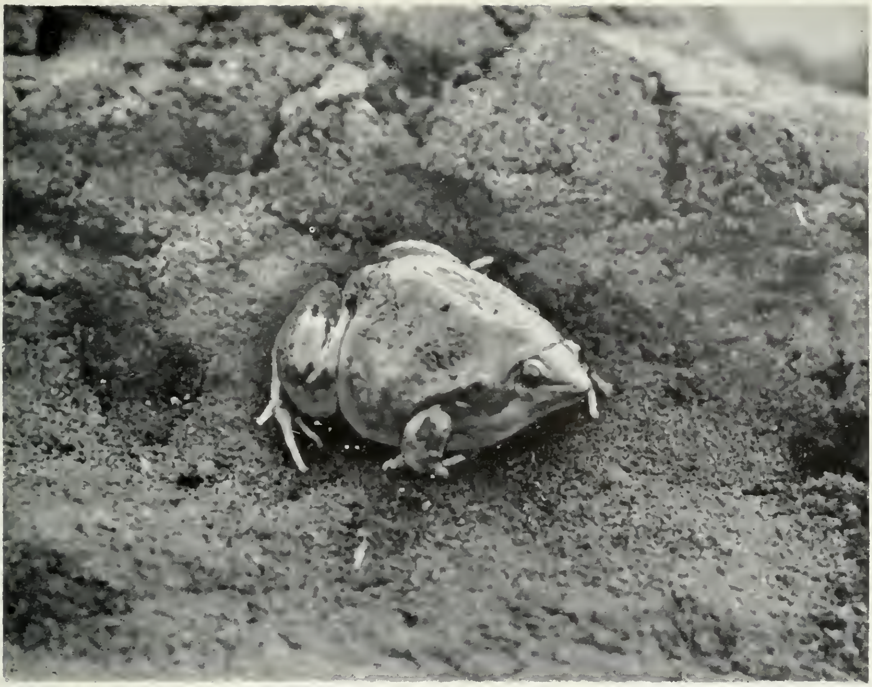
Plate XLII

Hemisus marmoratum (Peters).



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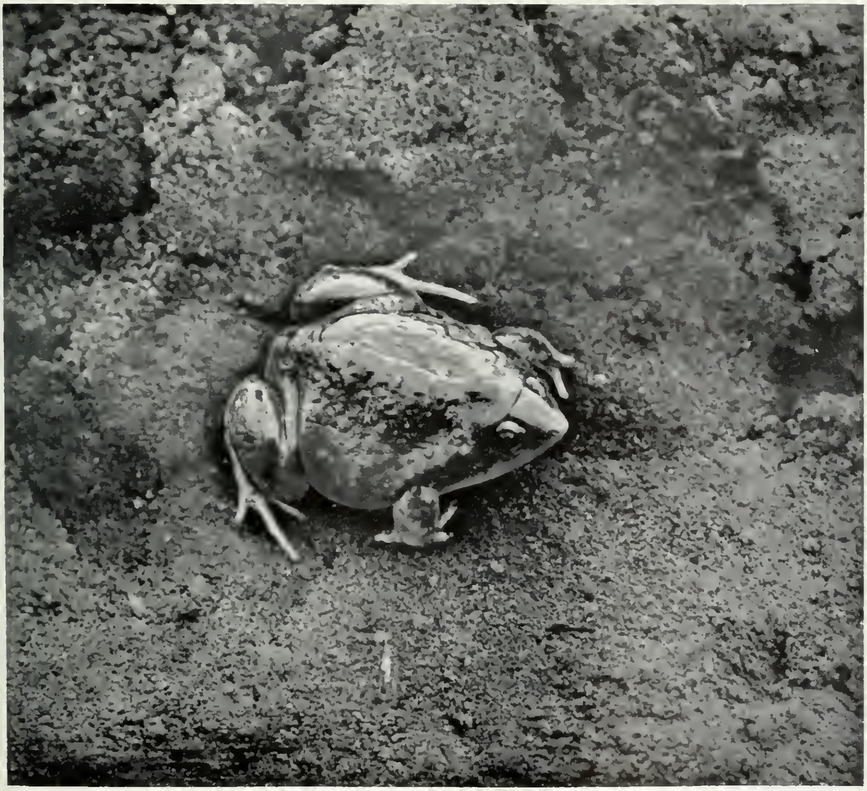

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59.57,21 (67.5)

Article III.—THE DERMAPTERA OF THE AMERICAN MUSEUM CONGO EXPEDITION, WITH A CATALOGUE OF THE BELGIAN CONGO SPECIES[1]

By James A. G. Rehn
The Academy of Natural Sciences of Philadelphia

The Dermaptera secured by the American Museum Congo Expedition were collected entirely in the north-eastern Belgian Congo, no material from the Lower Congo being contained in the series. As previous collections of the order made in the Congo were largely from the Lower Congo or from the Lake Kivu-Ruwenzori regions, the present representation is of particular interest. Taken partly in the Forest Province and partly in the Sudanese Subprovince of the Savannah Province (of Engler) the series has, in addition, a value much out of proportion to its size, as the extent of the range of a number of species can now be more clearly defined from the information here given.

It is the intention of the author in a future paper on the American Museum Congo Expedition collection of Orthoptera, with which order the Dermaptera often have been associated, to summarize analytically the distributional data here presented in detail under the respective species.

The number of specimens of Dermaptera contained in the collection of the Congo Expedition is two hundred and seventy-two, representing thirteen genera and nineteen species, of which one species (*Diplatys quæsitus*) is new. The study of the material brought to light the necessity of placing in synonymy for the first time one generic and four specific names.

A few specimens from Elisabethville, Katanga, belonging in the Hebard Collection, which is on deposit in the Academy of Natural Sciences of Philadelphia, have been discussed in the present report, as it seemed desirable to include all available material from the Belgian Congo. The paucity of available material from the Katanga district makes this series of Dermaptera and Orthoptera of especial interest.

The author has used consistently the term "German" East Africa to cover the region formerly so called, the marks indicating that the qualifying term has been quoted. This method seems to be the best to follow at this writing, as knowledge of the recent division of the former German possession is by no means general; the present names, where different from former ones, are given in parentheses.

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[1] Scientific Results of the American Museum Congo Expedition. Entomology, No. 8.

The catalogue of the Dermaptera known from the Belgian Congo follows the systematic treatment of the species (p. 401). The general plan followed in making the synonymic catalogue is discussed in that portion of the paper.[1]

The author wishes to express his thanks to the American Museum authorities for the opportunity to study this interesting series, and to Messrs. Herbert Lang and James P. Chapin for their friendly interest and encouragement, as well as substantial assistance, in his studies of the material which they secured while on the Congo Expedition. For much useful information concerning the Belgian Congo the author is under lasting obligations to Dr. J. Bequaert, whose kind assistance has been sought by me on a number of occasions.

APPROXIMATE POSITION OF BELGIAN CONGO LOCALITIES MENTIONED IN THIS PAPER

In collating the data here given I have drawn freely upon those already utilized in previous papers based on the Congo Expedition collections. In several cases we have been unable to identify certain localities given by other authors. These names are here given with a notation to the effect that they have not been located by the present author.

Akenge (Uele).—2° 55′ N., 26° 50′ E.
Avakubi (Ituri).—1° 20′ N., 27° 40′ E.
Barobiti (Uele).—Position unknown.
Batama (Stanleyville).—1° N., 26° 40′ E.
Bengamisa (Stanleyville).—1° N., 25° 10′ E.
Bena Bendi (Kasai).—4° 15′ S., 20° 20′ E.
Beni (Semliki).—0° 20′ N., 29° 40′ E.
Boma (Lower Congo).—5° 50′ S., 13° 10′ E.
Buta [Rubi] (Uele).—2° 50′ N., 24° 50′ E.
Elisabethville (Katanga).—11° 45′ S., 27° 40′ E.
Faradje (Uele).—3° 40′ N., 29° 40′ E.
Garamba (Uele).—4° 10′ N., 29° 40′ E.
Hiri River.—Probably a misspelling of Itiri R. = Semliki R.
Ibembo (Uele).—2° 40′ N., 23° 35′ E.
Kasindi (Semliki).—0°, 29° 40′ E.
Kimpoko (Lower Congo).—4° 10′ S., 15° 40′ E.
Kinshasa (Lower Congo).—4° 20′ S., 15° 20′ E.
Kindu (Ponthierville).—3° S., 26° E.
Kirima (Lake Albert Edward).—0° 15′ S., 29° 30′ E.
Kuako (Lower Congo).—4° 15′ S., 16° 35′ E.
Kwidjwi (Lake Kivu).—2° 10′ S., 29° 20′ E.
Leopoldville (Lower Congo).—4° 25′ S., 15° 20′ E.
Lingunda (Maringa).—1° N., 20° 40′ E.
Luebo (Kasai).—5° 25′ S., 21° 25′ E.
Luki (Lower Congo).—5° 35′ S., 13° 10′ E.
Lusambo (Kasai).—4° 55′ S., 23° 15′ E.
Madimba (Lower Congo).—4° 50′ S., 15° 15′ E.
Malela (Lower Congo).—6° S., 12° 40′ E.
Mawambi (Ituri).—1° 10′ N., 28° 45′ E.
Medje (Ituri).—2° 25′ N., 27° 30′ E.
Moëra [Forest] (Semliki).—0° 35′ N., 29° 30′ E.

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[1] An important paper by Borelli on Belgian Congo Dermaptera, 'Dermaptères du Congo Belge' (Revue Zoologique Africaine, XI, pp. 412-434, (1923)), was not received until the present paper was in page-proof. The student should refer to Borelli's paper as supplementary to the date here presented.

Niangara (Uele).—3° 40′ N., 27° 50′ E.
Niapu (Ituri).—2° 15′ N., 26° 50′ E.
Ninagongo (Kivu).—1° 30′ S., 29° 20′ E.
Popokabaka (Kwango).—5° 40′ S., 17° E.
Risimu (Stanleyville).—1° N., 26° 45′ E.
Rutshuru (Kivu).—1° 15′ S., 29° 30′ E.
Ruwenzori [western slopes].—0° 30′ N., 29° 50′ E.
Ruzizi [Valley] (Kivu).—3° S., 29° E.
Semliki River.—0° to 1° N., 29° 30′ to 30° E.
Stanley Pool.—4° 15′ S., 15° 30′ E.
Stanleyville.—0° 30′ N., 25° 15′ E.
Ukaika (Ituri).—0° 45′ N., 29° E.
Vankerckhovenville (Uele).—3° 20′ N., 29° 20′ E.
Yakuluku (Uele).—4° 20′ N., 28° 50′ E.

SYSTEMATIC DISCUSSION

HEMIMERINA

Hemimeridæ

HEMIMERUS Walker

1871, 'Catal. Dermapt. Salt. Brit. Mus.,' V, Suppl., p. 2.

GENOTYPE.—*Hemimerus talpoides* Walker.

This remarkable genus is the sole member of the suborder and, consequently, of the family to which it belongs, and in many ways it is one of the most extraordinary of known insects. Originally supposed by Walker to be a gryllid related to *Tridactylus*, Saussure, in 1879,[1] considered it to represent a new order of insects which he called Diploglossata. Hansen, however, in 1894,[2] showed that Saussure erred in his interpretation of the single specimen he had examined. Hansen proved that, instead of having a second or double labium as supposed by Saussure, the mouthparts exhibit but little departure from the ordinary mandibulate type, and he concluded that *Hemimerus* represented a separate family near the earwigs, for which Sharp, in 1895,[3] used the name Hemimeridæ. Subsequent work has sustained the conclusions of Hansen as to the proper position of *Hemimerus*, and our placing of the genus as representing a suborder of the Dermaptera is according to Burr in his comprehensive treatment of the genera of the order.[4]

The gross anatomy of *Hemimerus* has been treated in detail by Hansen and others and its general structure is now well known. It is entirely apterous and eyeless, and has peculiar limbs and very elongate cerci, while certain other features of its morphology are quite distinctive.

In habits *Hemimerus* is parasitic, living on the murid rodent *Cricetomys gambianus* and possibly on a related species of that genus, although it is not a parasite in the more special sense of the word. It has been assumed that the relation was commensal, but this has not been proven. The fact of its remarkable association with *Cricetomys* was first noted by Sjöstedt, as recorded by Hansen,[1] and subsequently it was supposed that the insect fed upon fungi found upon the skin of the mammal. Heymons has shown,[2] however, that the principal food of *Hemimerus* is the outer horny epidermis of its host. Another remarkable feature of *Hemimerus* is that it is viviparous, and this is rather unusually qualified for an insect by the fact that birth is given to but one young at a time.[3] When born the immature individuals show a general resemblance to the adults.

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[1] 1879, Mém. Soc. Phys. et Hist. Nat. Genève, XXVI, pp. 399–420, Pl. I.
[2] 1894, Entom. Tidskrift, XV, pp. 65–92, Pls. II and III.
[3] 1895, 'Cambridge Nat. History,' V, p. 217.
[4] 1911, 'Genera Insectorum, Dermaptera,' p. 8.

Hemimerus hanseni Sharp

Hemimerus talpoides HANSEN, 1894, Entom. Tidskrift, XV, p. 65, Pls. II and III. (Not *Hemimerus talpoides* Walker.) Kitta, Gold Coast.

Hemimerus hanseni SHARP, 1895, 'Cambridge Nat. History,' V, p. 217, figs. 114–116. (Based on Hansen's description and figures.)

Region of the Uele. (Dr. J. Rodhain: "off *Cricetomys gambianus*.") One adult male, three adult females, seven immature individuals. (Alcoholic.)

Considered by a number of authors to be inseparable from *talpoides* of Walker, the Central African form of this genus has been shown by Carpenter[4] to be quite distinct, and material now before us fully corroborates the conclusions reached by him. Walker's species, which was figured by Saussure[5] from original Walkerian material, was described from Sierra Leone, and we are fortunate enough to have before us, from the Hebard Collection, a single female labelled "Freetown, Sierra Leone, IX, 17, 1899, E. E. Austin. From rat known as ground pig." This specimen enables us to endorse fully what Carpenter has said concerning the differential features.

The seven immature specimens represent three instars, presumably the three preceding maturity. Vosseler[6] has given interesting morphological notes on the immature stages of this species, there called *talpoides* but instead representing *hanseni* as his Fig. 4 shows.

The localities given in the literature which are clearly referable to *hanseni* are Kitta, Gold Coast, and Rio del Rey, Cameroon (Hansen as *talpoides*), Entebbe, Uganda (Carpenter) and in the vicinity of Amani, east Usambara mountains, East Africa (Vosseler as *talpoides* but illustration shows material to be *hanseni*), while probably the specimens reported as *talpoides* by Jordan as taken on the Ruwenzori Expedition at an unmentioned locality, and that by Bouvier from Guengere, Portuguese East Africa, refer to this species. True *talpoides* Walker is definitely known only from Sierra Leone, although Cook's record from Liberia probably correctly refers to that species. It is certain, however, that *Hemimerus hanseni* ranges from the Gold Coast to north-eastern "German" East Africa (Tanganyika Territory), at least as far north in the interior as the region of the Uele and southern Uganda, and probably south-east to Portuguese East Africa (Guengere). Whether *talpoides* and *hanseni* occur in the same region remains to be determined, also whether the former is found on *Cricetomys gambianus* or a related form of the genus.

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[1] 1894, *op. cit.*, pp. 81–82.
[2] 1911, Deutsche Entom. Zeitschrift, pp. 163–174.
[3] Hansen, 1894, *op. cit.*, pp. 78–80.
[4] 1909, Entom. Monthly Magazine, (2) XX, pp. 254–257, Pl. IV.
[5] 1897, Mém. Soc. Phys. et Hist. Nat. Genève, XXVI, pp. 399–420.
[6] 1907, Zoolog. Anzeiger, XXXI, pp. 447–449, figs. 3–4.

Schouteden (1919, Bull. Soc. Entom. Belgique, I, pp. 35 to 37) has reported *Hemimerus talpoides* as taken from *Cricetomys gambianus* secured in the Ituri District. The material examined by him probably represents the present species. The two records here given constitute our sole knowledge of the occurrence of the genus in the Belgian Congo.

PROTODERMAPTERA

Pygidicranidæ

Diplatyinæ

DIPLATYS Serville

1831, Ann. Sci. Nat., XXII, p. 33.

GENOTYPE.—*Diplatys macrocephalus* (*Forficula macrocephala* Palisot de Beauvois). (Monotypic.)

The genus *Diplatys* comprises nearly forty species from both hemispheres but all tropical in their distribution. In the Old World the genus has the distribution shown in the accompanying map (Fig. 1) which is based on definite records in the literature. Its absence from the Papuan region is noteworthy, also the lack of information on the genus from southern Africa. From Africa and Madagascar fourteen species have been described, but the identity of several of these species, which were founded upon the female sex alone, is not clearly established at this writing. The sexes are quite different in certain features, as the form of the pronotum, forceps, and ultimate dorsal and penultimate ventral abdominal segments, while the abdomen is markedly specialized in the male sex of certain species, one of which is here described. It is by no means certain that some of the sex correlations made in the past are correct. It is also probable that two color types may occur in each of several of the species of the genus. In consequence, systematic work on material of the genus is not at all an easy matter; the determination of isolated females is extremely difficult or impossible.

The larval forms of species of *Diplatys* possess long segmented cerci or caudal styles, which resemble antennæ and are composed of from fifteen to thirty segments. The basal segment of these is quite long and is a sheath for the developing forceps of the adult.

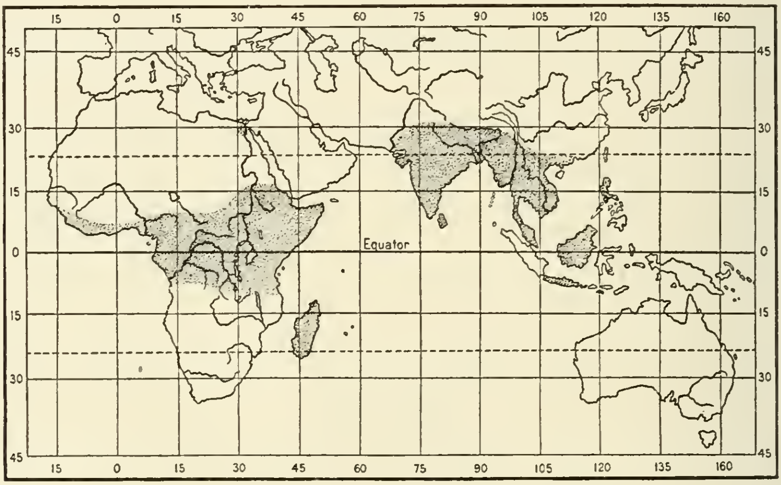


Fig. 1. Old World distribution of the genus *Diplatys*.

Individuals of the genus have been taken from under the bark of trees (*macrocephalus*), from dead leaves (*jansoni* and *severa*), from under flower pots (*gladiator*) and from flowers of nettle (*siva*). But a single identifiable species is included in the present collection and this is new to science. A single previously known species (*macrocephalus*) has been recorded from the Belgian Congo.

Key to the Congo Species of *Diplatys*

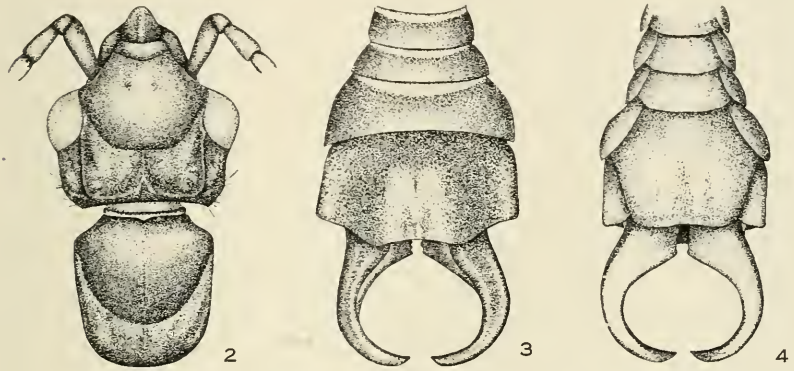
1. Ultimate dorsal abdominal segment of male with lateral margins gently arcuate. Forceps of male with branches thick and heavy in proximal third, there contiguous on median line, distad tapering and weakly arcuate, the space between the branches long elliptical. . . . *macrocephalus* (Palisot de Beauvois).

Ultimate dorsal abdominal segment of male with lateral margins straight, subparallel. Forceps of male with branches thick and heavy at extreme base only, there very briefly contiguous on median line, thence the branches strongly taper and are markedly falciform arcuate, the space between the branches transverse ovate........................*quæsitus*, new species.

Diplatys quæsitus, new species

TYPE.—Male; Faradje, Belgian Congo; January, 1913; Lang and Chapin; A. M. N. H. No. 28068.

Size medium (for the genus). Form much as in *D. macrocephalus*, occiput depressed, abdomen expanded distad; surface weakly shining, of head, pronotum, tegmina, exposed portions of wings and limbs with numerous long hairs; abdomen with adpressed pile, this very sparse on dorsal surface, more thickly placed on the ventral surface, where scattered long hairs also occur.



Figs. 2–4. *Diplatys quæsitus*, new species. Male (type).

Fig. 2. Head and pronotum. Fig. 3. Dorsal surface of apex of abdomen. Fig. 4. Ventral surface of apex of abdomen. All greatly enlarged.

Head slightly longer than broad, mouth-parts moderately produced, occipital region subquadrate; interocular and interantennal region moderately inflated, broadly arcuate in section, sharply and arcuately margined caudad; occipital region with lateral carinæ caudad of internal margin of eyes pronounced and elevated, weakly arcuate-sinuate; area between carinæ markedly excavate, rugulose, a decided medio-longitudinal sulcus present in the excavated area; caudal margin of occiput very faintly concave, caudo-lateral angles obtuse; lateral margins of head caudad of eyes parallel for one-half of their length, then obliquely subtruncate to the caudo-lateral angles. Eyes prominent, in length nearly equal to post-ocular margin of head, with facets sharply indicated but with rounded surfaces. Antennæ nineteen-segmented, relatively heavy; proximal joint moderately inflated but relatively short; second joint very short; third joint two-thirds as long as the first joint, weakly enlarging distad; fourth joint moniliform, three-fourths as long as the third; fifth joint similar to the fourth but longer; thence the joints are of similar type but of increasing length; distal joint depressed and sub-ovate.

Pronotum faintly longer than broad, greatest width at cephalic fifth and subequal to width of occipital margin of head between the caudo-lateral angles; cephalic margin of pronotum truncate, laterad briefly oblique truncate to the point of greatest width, where the angles are obtuse; lateral margins very faintly arcuate, moderately converging caudad and broadly rounding into the arcuate caudal margin; disk of pronotum embracing the cephalic three-fourths of surface, bullate, with a brief and shallow medio-longitudinal sulcus, caudal and lateral margins of disk semi-ovate in outline; caudal and lateral portions of pronotum subtranslucent, upcurved, a weak medio-longitudinal carina present on caudal section.

Tegmina about two and one-half times as long as pronotum, relatively broad; humeral shoulders pronounced, but broadly rounded; distal margin arcuate, faintly oblique subtruncate suturad. Exposed portion of wings nearly half as long as the tegmina, narrowing distad, distal extremity sharply truncate.

Abdomen, except for the three distal segments, cylindrical, each individual segment with the faint median transverse constriction found in males of the group to which this species belongs, thus giving the articular portions of the segments a subnodose appearance. Antepenultimate tergite no longer than the tergite preceding it, but markedly broadening distad; penultimate tergite mesad slightly longer than the preceding tergite, regularly expanding laterad, its distal margin regularly concave; ultimate tergite rectangulate, appreciably transverse, its median length contained one and two-thirds times in its greatest width; lateral margins of ultimate tergite straight, parallel; caudal margin of same truncate mesad, very weakly oblique and subconcave laterad; caudo-lateral angles sharp and rectangulate; surface of ultimate tergite obliquely subdepressed caudo-laterad, regularly passing into the more elevated and yet subdeplanate median area. Antepenultimate sternite corresponding in its expansion to its tergal equivalent; penultimate sternite very large, as usual in the group, extending to the distal margin of the ultimate tergite, equalling the penultimate tergite in width; lateral margins of penultimate sternite straight, moderately converging, its caudal margin very weakly and shallowly biarcuate, the median portion shallowly concave; caudo-lateral angles rounded obtuse; ultimate sternite hidden. Forceps short, no longer than the ultimate tergite, strongly arcuate, the enlarged proximal portion very short, but briefly evident distad of the ultimate tergite, the branches regularly narrowing from this portion to the acute, subdepressed, striate apices; dorsal surface of forceps branches faintly excavate in median third, internal margin of this surface appreciably cingulate; internal surface of branches of forceps deplanate: contiguous portions of enlarged proximal sections denticulate, the armament of the two portions correlating in their "bite." Pygidium not evident.

Limbs of the usual type for the genus, moderately elongate and slender; cephalic tibiæ weakly arcuate, median and caudal tibiæ straight, all tibiæ appreciably compressed. Tarsi with the proximal joint slightly longer than the third.

ALLOTYPE.—Female; Faradje, Belgian Congo; March, 1911; Lang and Chapin; A. M. N. H. No. 28069.

This sex differs from the description of the male (type) in the following noteworthy features.

Size smaller; dorsal surface of abdomen more pilose than in male.

Eyes less prominent than in male. Antennæ more slender than in other sex.

Abdomen more robust, fusiform, distinctly narrowing distad. Ultimate tergite with its proximal width slightly greater than its median length, moderately narrowing caudad; caudal margin obliquely subconcave laterad, biarcuate dorsad of the axis of each branch of the forceps and with a median arcuate emargination, appreciably thickened in the arcuate section, a faint medio-longitudinal carinulation present on distal fourth of segment. Forceps simple, of the type usual in females of this genus, hardly longer than the ultimate tergite, attenuate with weakly hooked apices, weakly upcurved; internal margin of branches crenulato-denticulate for the greater portion of its length. Penultimate sternite very ample, reaching a short distance distad of the distal margin of the ultimate tergite, sublinguiform, the lateral margins converging sinuate, the distal portion faintly more than one-half as wide as the ultimate tergite, the distal margin strongly arcuate.

General coloration of head, abdomen and forceps blackish liver-brown, the tegmina and exposed portions of wings, excepting the usual oblique translucent portion, which is whitish, similar, but slightly less blackish in the female and approaching chestnut-brown, a narrow proximal portion of the tegmina in the female clay-color. Pronotum of male solidly of the general dorsal color; of the female clay-color with a pair of irregular, short lateral dashes near the cephalic margin. Antennæ of the general color in the male, of the female bister. Femora of the general color, with proximal portion broadly and distal section narrowly pale clay-color; tibiæ and tarsi generally pale clay-color, the tibiæ infuscate with the general color, the cephalic pair entirely so, the median ones largely washed with it and the caudal pair having it weaker and more proximal; tarsi of male largely infuscate with the general color, of female with arolia alone of that shade.

Male.—Length of body, 12.7 mm.; length of pronotum, 1.4; length of tegmen, 3.5; greatest width of ultimate tergite, 2.6; length of forceps, 1.9.

Female.—Length of body, 10.7 mm.; length of pronotum, 1.4; length of tegmen, 3.4; length of forceps, 1.4.

The type and allotype are the only specimens of the species we have seen. There is a bare possibility of the female sex not being conspecific with the type, but we feel little uncertainty on this point. The difficulty of correlating sexes in this genus is very great.

A relative of the African *D. macrocephalus* (Palisot de Beauvois)[1] and *riggenbachi* Burr,[2] and the Indian *D. gladiator* and *falcatus* Burr. It is distinguished from *macrocephalus* by the features given above in the key; from *riggenbachi* it differs in lacking the characteristic sculpture of the ultimate dorsal abdominal segment of the male of that species, in the broader distal portion of the penultimate ventral abdominal segment of the male, and in having the proximal portion of the forceps of the male dilated in less than the basal third. The resemblance of the present species to the Indian *gladiator* and *falcatus* Burr is very great, the latter being surprisingly close in relationship, but it can be distinguished from the new form by the less strongly arcuate forceps and the less strongly transverse ultimate dorsal abdominal segment. *D. gladiator* is wingless, with a proportionately larger pronotum and much reduced tegmina, but with considerable similarity in the form of the forceps.

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[1] 1805, 'Ins. Rec. Afriq. Amér.,' p. 36, Orth. Pl. I, fig. 3. Benin, southern Nigeria.
[2] 1911, Ann. Mag. Nat. Hist., (8) VIII, p. 39. Garna (error for Garua), Cameroon.

Karschiellinæ

Bormansia Verhoeff

1902, Zoolog. Anzeiger, XXV, p. 184.

Genotype.—*Bormansia africana* Verhoeff. (Selected by Kirby, 1905.)

This remarkable genus is known from South and East Africa, from the Transvaal north to British East Africa (Kenya Colony), Uganda, and the north-eastern Belgian Congo. The equally remarkable and related *Karschiella* Verhoeff apparently replaces *Bormansia* over the greater portion of the Western Forest Province. These two genera comprise the subfamily Karschiellinæ.

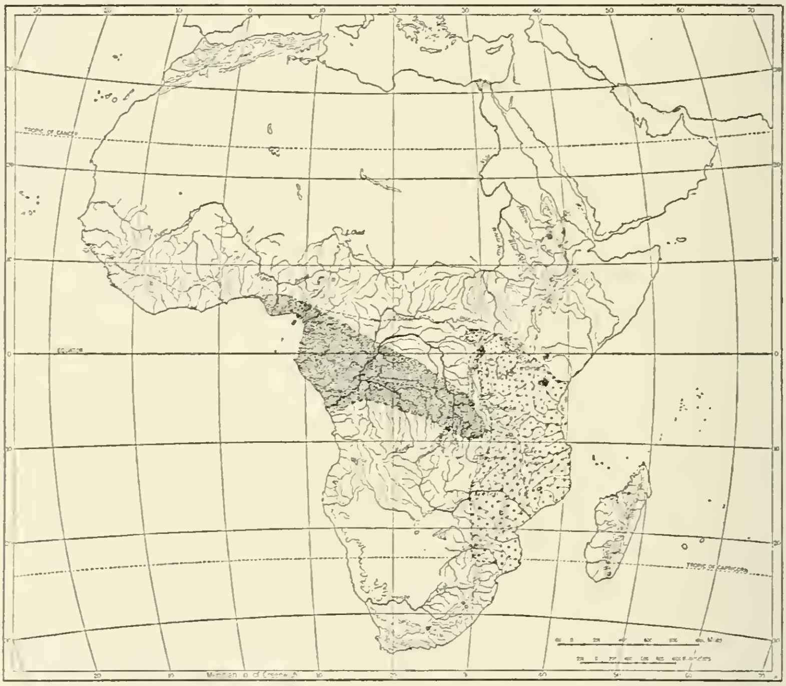
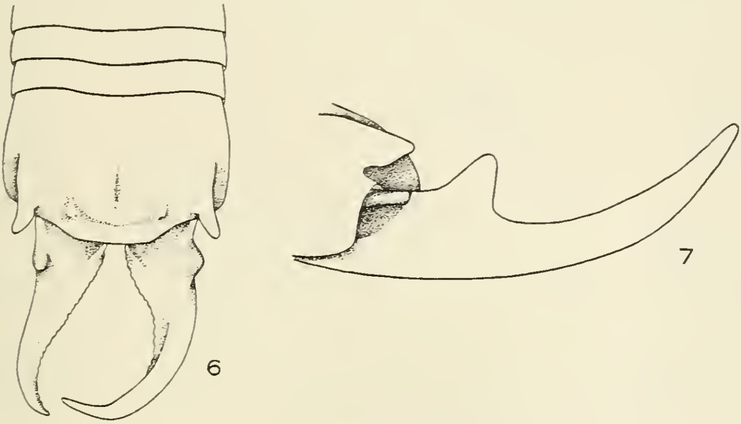


Fig. 5. Distribution of the genus *Bormansia* (open stipple) and *Karschiella* (close stipple).

The areas indicated have been made from the known records, and the actual ranges may be found to be more extensive when more exhaustive examination of Africa has been made. It is evident from this map that *Karschiella* is a Forest Province equivalent of the Savannah Province *Bormansia*.

The larval forms of species of this genus resemble those of *Diplatys* in that they possess distinct segmented cerci, the basal joint of which develops into the forceps of the adult. Beyond the proximal joint, in the larvæ, the cerci are made up of a series of fifteen to sixteen joints, of which four to five possess on the inner side a spinule directed toward the base.

But a single species of *Bormansia* is known from the Belgian Congo and that solely by the present records.[1]



Figs. 6–7. *Bormansia africana* Verhoeff. Male. Garamba, Belgian Congo.
Fig. 6. Dorsal surface of apex of abdomen, ×6. Fig. 7. Lateral outline of left branch of forceps, ×9.

Bormansia africana Verhoeff

Bormansia africana Verhoeff, 1902, Zoolog. Anzeiger, XXV, p. 184. ♂, ♀. "German" East Africa (Tanganyika Territory).

Medje, 1910; one female. Garamba, June to July 1912; one male. (Lang and Chapin.)

Both of these specimens are typical *africana*. We are not in a position to make any comment upon Burr's synonymy of *B. impressicollis* Verhoeff with *africana*. The present species was previously known only from "German" East Africa (Tanganyika Territory) and Western Uganda (Unyoro, reported by Borelli); while the clearly closely-allied, if distinct, *impressicollis*[2] has been recorded from Taita, Taveta, Kilimanjaro and

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[1] Rehn (1905, Proc. U. S. Nat. Mus., XXIX, p. 504), recorded *Bormansia meridionalis* Burr from Luebo, Congo, but Burr has since shown (1910, Proc. U. S. Nat. Mus., XXXVIII, p. 444) that the specimen is not mature and represents *Karschiella camerunensis*.

[2] *Bormansia impressicollis* Verhoeff, 1902, Zoolog. Anzeiger, XXV, p. 184. ♀. Taita, "German" East Africa (Tanganyika Territory).

Daressalaam, East Africa, and Butiti, western Uganda, at an elevation of 1900 to 2000 meters. The Medje record is the first one of the species from within the Rain Forest, Garamba being in the Savannah region, which is more akin to East Africa.

The forceps of the male are quite asymmetrical, the right branch being rather sharply bent arcuate briefly distad of the dorsal tooth, thence subfalciform to the apex. The left branch is much more regular in its arcuation.

The two specimens measure (in millimeters) as follows:

	Length of Body (Exclusive of Forceps)	Length of Pronotum	Greatest Width of Pronotum	Length of Forceps[1]
♂ Garamba	22.0	3.5	3.7	5.5
♀ Medje	19.0	3.2	3.5	4.7

Echinosomatinæ

ECHINOSOMA Serville

1839, 'Hist. Nat. Ins., Orth.,' p. 34.

GENOTYPE.—*Echinosoma afrum* (*Forficula afra* Palisot de Beauvois). (Monotypic.)

In the tropics of the Old World we find the subfamily Echinosomatinæ, comprising the single genus *Echinosoma*, filling the place occupied in the New World by the related Pyragrinæ. Both groups are interesting by reason of having the body clothed with pubescence (Pyragrinæ) or with short stiff bristles (*Echinosoma*), either condition being unusual in the earwigs.

The genus *Echinosoma* comprises somewhat more than a dozen forms with short forceps, showing on merely casual examination little difference in the sexual types of the forceps and with quite variable color markings. Much synonymy has been made by the description of mere color phases as species, but more broadly comparative work of recent years has shown the true relationship of a number of these forms.

Little is known of the habits of these insects, other than that they live in rotten wood, often in colonies,[2] and individuals have been taken from a termites' nest.

Equatorial Africa with Madagascar, Ceylon, India, Burma, and the Malayan and Australasian regions, as far as New Guinea and northern

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[1] Measurement of the left branch, taken in straight line, i.e., shortest distance from base to tip.

[2] Palisot states that *E. afrum* lives under stones, but this is not supported by the observations of others, and is not what would be expected from the character of the insect.

Australia, comprise the range of the genus. Five species are known from the mainland of Africa, and two others from Madagascar. The West African *rufum, congolense,* and *concolor* Borelli have not been recorded from the Belgian Congo. These are small species much resembling the South African *E. wahlbergi,* although *rufum* is said to be close to *E. afrum,* from which, however, it appears to be quite distinct.

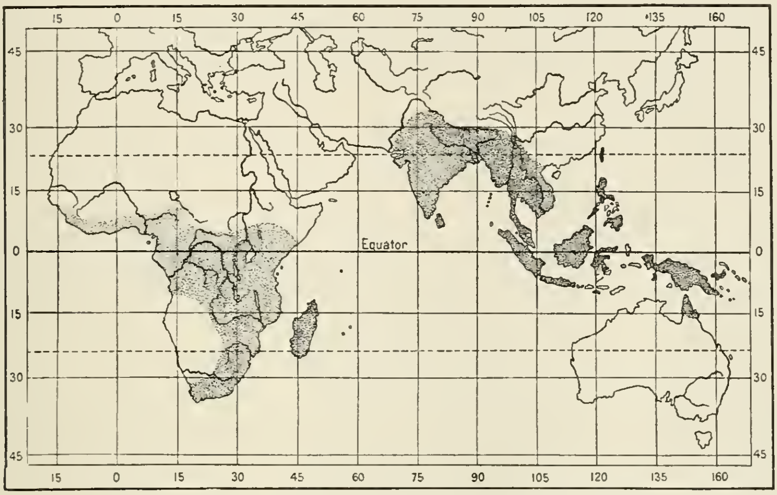

Fig. 8. Known distribution of the genus *Echinosoma.*

The genus is seen to extend into the Australasian Region, but is apparently absent from the more arid portions of southwest Africa.

Key to the Belgian Congo Species of *Echinosoma*[1]

1. Penultimate ventral abdominal segment of male with the margin broadly and regularly arcuate with a median concavity. Pygidium of female transverse, constricted mesad transversely, distal margin thickened, dorsal surface of pygidium appreciably excavate. Surface of abdomen less chætulose, smoother, more polished............... *afrum* (Palisot de Beauvois).

Penultimate ventral abdominal segment of male with the margin obliquely emarginato-truncate laterad, mesad very shallowly obtuse-emarginate, passing by broad, low, rounded lobations into the lateral portions of the margin. Pygidium of female narrow, tapering, linguiform, apex rounded, deplanate ventrad, dorsad not excavate. Surface of abdomen much more distinctly and regularly chætulose, less polished. *occidentale* Bormans.

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[1] Dohrn's *E. wahlbergi* has been recorded from Lingunda, Congo, by Burr, but we have reason to question the West African records of this species, as it evidently has been confused with true *E. afrum.*

Echinosoma afrum (Palisot de Beauvois)

Forficula afra Palisot de Beauvois, 1805, 'Ins. Rec. Afriq. Amér.,' p. 35, Orth. Pl. i, fig. 1. ♀. "Kingdom of Oware and Benin" (in present Southern Nigeria).
Echinosoma fuscum Borelli, 1907, Ann. Mus. Civ. Stor. Nat. Genova, XLIII, p. 350. ♂. Fernand Vaz, French Congo; Basilé, Island of Fernando Po.

Medje; July 24 to 30, 1910, June, 1914 and July, 1914; two males and two females. (Lang and Chapin.)

Palisot's figure represents the present insect, the form of the female pygidium being clearly and accurately drawn. The above synonymy was indicated recently by Burr[1] and appears to us to be correct.

Structurally this species is separable from *E. occidentale* by the following features:

Surface of the abdomen in females less heavily and thickly chætulose than in *occidentale*, being nearly as naked as in the males.

Penultimate ventral abdominal segment of male with the margin broadly arcuate with a weak median concavity; in *occidentale* the margin is obliquely emarginato-truncate laterad with a pair of broad, low, rounded lobes distad, the margin between shallowly concave-emarginate. In the female sex the margin of this segment is regularly arcuate in *afrum;* bisinuato-truncate, with a very weak median arcuation, in *occidentale.*

Pygidia of males of the two species very similar, showing little of diagnostic importance; in the female the pygidium is of differential value, in *afrum* being transverse, constricted transversely mesad, the free margin inflated and elevated, lateral angles rounded, lateral margins concave, expanding proximad and appreciably cingulate, dorsal surface excavate, particularly distad; in *occidentale* the pygidium of the female is more narrow, linguiform, regularly narrowing distad, with apex rounded, distal portion bent dorsad at nearly a right angle to the proximal portion.

Dohrn's *E. wahlbergi*, described from "Caffraria," is extremely close to *afrum,* in fact so similar that there exists a probability of *wahlbergi* being merely a geographic race of *afrum.* We have compared the present material with a male of *wahlbergi* from Durban, Natal, and, aside from the smaller size of the South African individual, the only features we have found which may be considered diagnostic are that the male penultimate ventral abdominal segment shows an approach toward that of *E. occidentale* in shape, and the decurved lateral portions of the fifth and sixth abdominal tergites are distinctly longitudinally carinulate, which is not the case in the males of *afrum,* while the margin of the same portions of those tergites is more angulate caudad in *wahlbergi* than in *afrum.* The size difference means relatively little, as *wahlbergi* is known to range in body length from ten to fourteen millimeters in the male sex.[1] Burr has recently stated that *wahlbergi* has a longer, more convoluted virga than *afrum*.[2]

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[1] 1915, Journ. Royal Microsc. Soc., p. 437.

It appears very probable to us that some, if not all, of the West African records of *E. wahlbergi* to be found in the literature refer to *afrum*, as *wahlbergi* is probably restricted to South and East Africa. It is probable also that *occidentale* has been misidentified as *afrum* and *afrum* as *wahlbergi*.

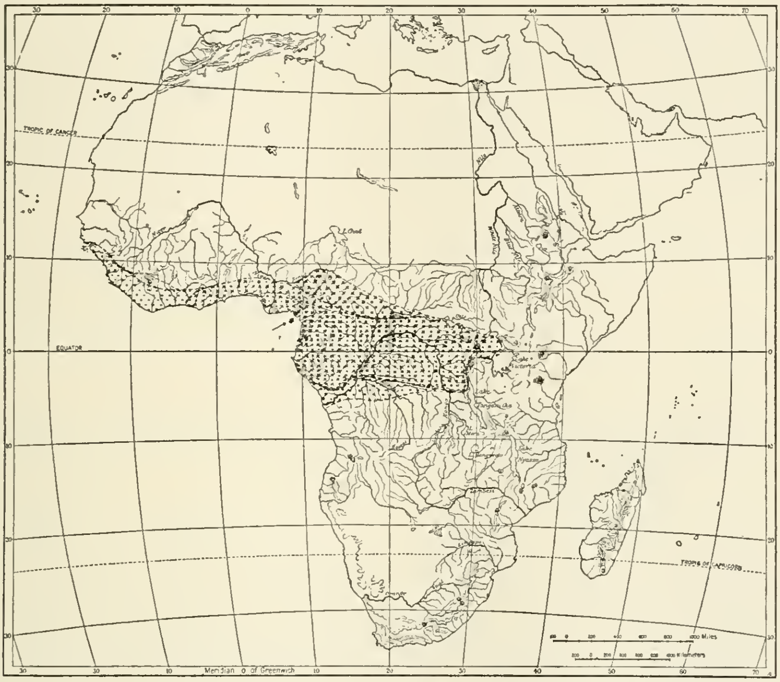

Fig. 9. Known distribution of *Eehinosoma afrum* (dots) and *E. occidentale* (crosses). It is evident that both species are forms of Western Forest Province origin.

The present series measures (in millimeters) as follows:

	Length of Body (Exclusive of Forceps)	Length of Pronotum	Greatest Width of Pronotum	Length of Tegmen	Length of Exposed Portion of Wings	Length of Forceps
♂	17.0	2.4	2.6	4.0	1.9	2.9
♂	17.0	2.4	2.5	4.0	2.0	2.6
♀	15.0	2.3	2.6	4.0	1.8	3.2
♀	17.0	2.5	2.8	4.2	2.0	3.0

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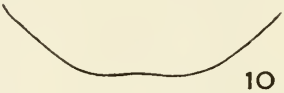
[1] Dohrn's original measurement of *wahlbergi* is ten millimeters, while Burr's *distanti*, now admitted by him to be a synonym of *wahlbergi*, is fourteen millimeters long.

[2] 1915, Journ. Royal Microsc. Soc., p. 437.

The present series shows less color variation than that of *E. occidentale*, in all the two proximal antennal joints being yellowish and the limbs always particolored and never solidly blackish. However, we find the dark area of the pronotum broken up into the longitudinal blackish and yellow lines quite decidedly in one female and to a lesser degree in one male. The exposed portion of the wings show distinct (one male) or faint and indefinite (remainder) dark spots on the yellowish ground color.

The species *afrum* is distinctly one of the Western Forest Province, and its distribution is shown in Figure 9 in conjunction with the other species known from the Belgian Congo. The extreme localities are Bissao, Portuguese Guinea; Entebbe, Uganda, and Kuako, Kasai District, Belgian Congo.[1] We feel considerable uncertainty regarding the exact identity of records in the literature credited to *afrum* and *occidentale.*



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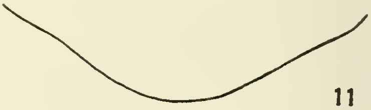

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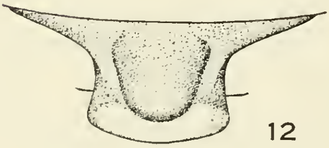

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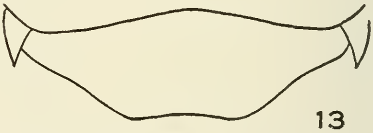

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Fig. 10. *Echinosoma afrum* (Palisot de Beauvois). Male. Medje, Belgian Congo. Outline of free margin of penultimate ventral abdominal segment. Fig. 11. *Echinosoma afrum* (Palisot). Female. Medje, Belgian Congo. Same portion as in Fig. 10. Fig. 12. *Echinosoma afrum* (Palisot). Female. Medje, Belgian Congo. Dorsal surface of pygidium. Fig. 13. *Echinosoma wahlbergi* Dohrn. Male. Durban, Natal. Same portion as in Fig. 10.

Echinosoma occidentale Bormans

Echinosoma occidentale Bormans, 1893, in Bolivar, Ann. Soc. Entom. France, LXII, p. 170. ♂. Assinie, Ivory Coast.

Medje, July, 1910, August to September, 1910, June, 1914 and July, 1914; one male and five females. (Lang and Chapin.)

Burr considers *occidentale* to be "a local race" of *afrum*, "well marked by the peculiar colouring of the elytra."[2] It is evident to us that two distinct species are represented, which may be differentiated by the characters given in the key and above under *E. afrum*. The accompanying figures will assist in the recognition of these forms. It is clearly evident from the occurrence of the two forms at Medje, and also at Fernand Vaz, French Congo, Ukaika-Mawambi, Upper Ituri, Belgian Congo, and Entebbe, Uganda, that one is not a local race of the other, and the structural features we have mentioned will serve to differentiate what are clearly species.

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[1] Burr has recorded the species from Barobiti, Congo, but repeated search has failed to give us any information on this locality. In consequence we have been compelled to disregard it in making our map.

[2] 1915, Journ. Royal Microsc. Soc., p. 437.

E. occidentale averages larger than *afrum*, and the abdomen of the male is slightly less polished, while that of the female is much more chætulose than in *afrum*. The form of the penultimate ventral abdominal segment in both sexes and the pygidium in the female are also distinctive in the two species.

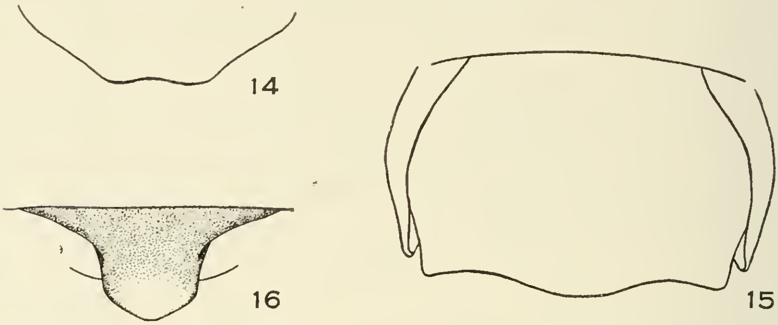
There is some variation in the exact shape of the distal portion of the pygidium of the female of this species, this section being more acute in some specimens than in others, but in all it retains its longitudinal and linguiform type, never approximating the transverse pygidium of the same sex of *afrum*.

The size shows considerable variation, the series measuring (in millimeters) as follows:

	Length of Body	Length of Pronotum	Greatest Width of Pronotum	Length of Tegmen	Length of Exposed Portion of Wing	Length of Forceps
♂	17.5	2.4	2.6	4.3	2.2	3.1
♀	17.6	2.5	2.8	4.2	2.0	3.0
♀	16.2	2.4	2.7	4.0	1.6	3.1
♀	19.7	2.4	3.0	4.4	2.2	3.5
♀	20.5	2.6	3.5	4.6	2.6	3.5
♀	22.0	2.9	3.5	4.7	2.2	3.7

The color instability of this species is well illustrated by the Medje specimens. From one extreme with the head, antennæ, pronotum, tegmina, abdomen, and limbs virtually uniform blackish, with the exposed portion of the wings yellow with a black spot, the color grades to a type which has the base color more rufescent brownish, the two proximal antennal joints yellowish, the pronotum with a yellowish base and bearing seven dark irregular longitudinal lines cephalad, the lateral three of these fusing into a pair of broad dark blotches caudad, the tegmina dark with the distal and disto-lateral margins edged with yellowish and the surface spotted with the same, the femora and tibiæ pale, annulate proximad with dark. In this condition the exposed portions of the wings are pale and may or may not (one single female) be supplied with a dark spot.

The distribution of this species will be seen, by reference to the map, to be very similar to that of *E. afrum*, although the present form has not been recorded from northwest of Assinie, Ivory Coast.



Figs. 14–16. *Echinosoma occidentale* Bormans.

Fig. 14. Male. Medje, Belgian Congo. Outline of free margin of penultimate ventral abdominal segment. Fig. 15. Female. Medje, Belgian Congo. Same portion as in Fig. 14. Fig. 16. Female. Medje, Belgian Congo. Dorsal surface of pygidium. All greatly enlarged.

Labiduridæ

Psalinæ

Anisolabis Fieber

1853, Lotos, III, p. 257.

Genotype.—*Anisolabis maritima* (*Forficula maritima* Géné). (Selected by Kirby, 1905.)

The genus *Anisolabis* has been used by most authors in the past to embrace a great number of species of apterous or psaline earwigs. In recent years the work of Zacher and Burr has shown the urgent necessity for subdividing this assemblage into a number of genera, which have been based largely on characters of the male internal genitalia. The last paper on the subject, one by Burr,[1] brings out valuable and useful characters, which will doubtless prove of great diagnostic importance when the whole subject has been more thoroughly treated. This last paper by Burr is, however, so incomplete and so haphazard in its treatment, being largely scattered notes thrown together, often with little co-ordination, that it is extremely difficult to follow. For instance, on page 530 *Anisolabis quærens* is described as new and on page 529 Borelli's *isomorpha* is considered an *Anisolabis*, while on page 534 the author states

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[1] 1915, Journ. Royal Microsc. Soc., pp. 524 to 545.

"the few species which I retain in the genus (i.e., *Anisolabis*) can be distinguished as follows," and in the key which does follow neither *quærens* nor *isomorpha* are included. On page 539 *isomorpha* is definitely placed in a new genus *Apolabis*, and the inference is that *quærens* should be similarly assigned but this is not stated. Until the exact generic position of these species is more clearly stated it seems most advisable to retain in the genus *Anisolabis* such of them as do not seem clearly generically separable, either from previous work or original examination.

Of the species placed by Burr in the restricted genus *Anisolabis*, none have been previously recorded from the Belgian Congo, but we here report one of them. Of the species generally placed in *Anisolabis*, but which are definitely or inferentially referred to *Apolabis* by Burr, ten have been recorded from West African localities, and one from Uganda, but none to date from the Belgian Congo.

The genus *Anisolabis* has as its genotype a species of world-wide distribution—*A. maritima*—which, however, lives up well to its specific name and is rarely found distant from the sea-coasts. In the African region it occurs in the Cape Verde and Canary Islands, in Madagascar, in Morocco, the Sinai Peninsula, and at Konakry, French Guinea.

Anisolabis[1] **pagana** Burr

Anisolabis pagana Burr, 1915, Journ. Royal Microsc. Soc., p. 535, fig. 61, Pl. x, fig. 8 (genitalia). ♂. Cameroon.

Stanleyville, August, 1909; one female. (Lang and Chapin.)

The reference of this specimen to Burr's *pagana* has the same element of uncertainty shared by the reference of any females of this genus to a species when accompanying males are not available. The differential characters are almost entirely peculiar to, or at least more strongly indicated in, the male sex. Our reasons for referring this specimen to *pagana* are: the shape of the penultimate sternite, which closely approximates that figured of the male, the distal margin slightly more arcuate and the surface of the plate smoother, as would be expected in the female; the shape and development of the exposed lateral portions of the last sternite, with its lateral processes and the oblique character of the margins, virtually identical with these as figured for the male; and the rounded lateral portions of the sixth to ninth tergites, as described in the male by Burr. Practically no characters aside from abdominal and male genital ones were given in the original description, so we have no aid from any other features.

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[1] The present author's *Anisolabis pluto* (1905, Proc. U. S. Nat. Mus., XXIX, p. 506, fig. 4), from Liberia, based on the female sex, has given Burr a great deal of trouble. In 1910 (Proc. U. S. Nat. Mus., XXXVIII, p. 448) he suggests that it may be the female of *rufescens*, but in a footnote to the same comment he states that it is the female of Dohrn's *angulifera*. In 1911 ('Genera Insectorum, Dermaptera,' p. 30) *pluto* is definitely placed as a synonym of *angulifera* and *rufescens* stands as a closely related species. Later the same year he concluded (Stettin. Entom. Zeitung, LXXII, p. 334), after examining Dohrn's type of *angulifera*, that *angulifera*, *rufescens* and *pluto* are identical. More recently, in 1915 (Journ. Royal Microsc. Soc., 1915, p. 530), he is uncertain of the correctness of any of his former actions, as he says, "It is not yet certain to which form we are to refer *A. pluto* Rehn, and *A. angulifera* Dohrn; the former is a smooth species, and might be the female of *A. quærens* or *A. pagana;* the type seems to be a little too big for *A. tumida*." It is evident from this that he questions his previously established synonymy, and with a paratypic female of *pluto* before us it is evidently not the female of *angulifera* as figured by Burr in the same paper (idem, p. 530, fig. 59), apparently from the type. Instead, *pluto* is clearly one of the species with rounded and nonproduced lateral angles of the abdominal tergites, even when sexual differences are considered. After carefully studying our specimen it appears to us that it is more probably the female of *Anisolabis quærens* Burr [idem, p. 530, fig. 60, ♂, Mundane (err. for Mundame), Congo (err. for Cameroon)]. If this proves to be the case, as appears quite probable to us, Burr's *quærens* must give way to the older *pluto*.

The body length is given by Burr as 10.5 mm., and that of the forceps as 2.75 mm. The present specimen is larger, the body measuring 14 mm. in length, while the forceps are 3 mm. long. Such difference is seen in the sexes of many psalids.

EUBORELLIA Burr

Borellia BURR, 1909, Deutsche Entom. Zeitschr., p. 325. (Not of Rehn, 1906.)
Euborellia BURR, 1910, Proc. U. S. Nat. Mus., XXXVIII, p. 448, footnote.

GENOTYPE.—*Euborellia mæsta* (*Anisolabis mæsta* Géné). (By original designation.)

The African forms referred to this genus by Burr in his last study of the psalid genera[1] are, at this writing, so imperfectly understood that any attempt to make a key to them, without possessing more material and making an entirely new study of the genus, would be of little permanent value. Externally the species are very similar, except for the development of the organs of flight, and the sexual differences in sculpture, etc., are such as to make associations of material as difficult as in the related genus *Anisolabis* and its numerous allies. As a modifying influence upon the diagnostic value of these apparent differences we now know that in this genus, and within the species now before us, the wings may be well developed or absent, the tegmina well developed or present as short epaulet-like structures, while certain species are totally apterous.

Thirteen species of the genus are known from Africa, of which two are entirely Madagascan. Of the remaining species, but two have been recorded from the Belgian Congo, although quite a few of the others have been reported from surrounding regions. One of the species of the genus —*E. annulipes*—is virtually cosmopolitan, doubtless carried by commerce. The African records of this latter species are chiefly coastal, but it has been reported from as far inland as Ibanda, Fort Portal, Kitagueta, and Masaka, Uganda, and Bugala, Sesse Archipelago, Victoria Nyanza.

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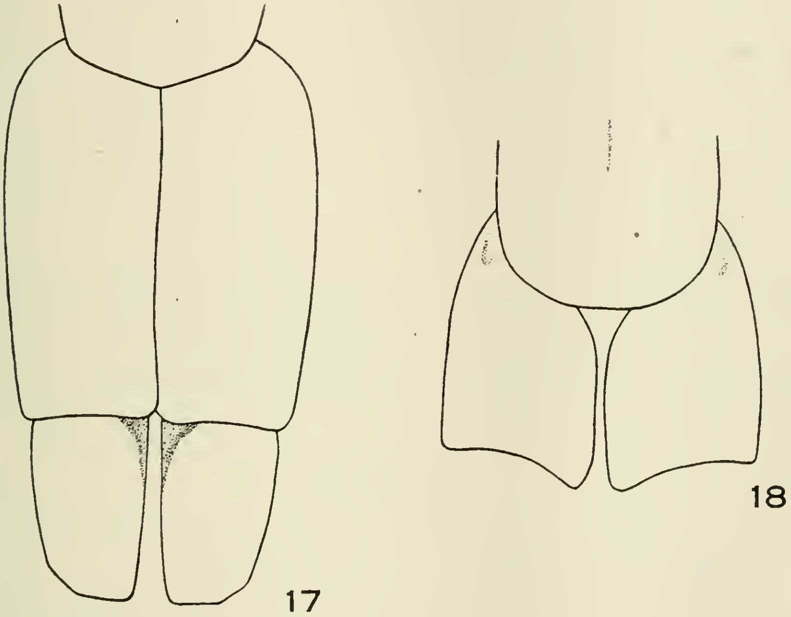
[1] 1915, Journ. Royal Microsc. Soc., p. 544.

Euborrellia cincticollis (Gerstæcker)

Brach[ylabis] cincticollis Gerstæcker, 1883, Mitth. Naturwiss. Ver. Neu-Vorpomm. und Rügen, Greifswald, XIV, p. 44. ♂, ♀. Bonjongo, Cameroon; Victoria, Cameroon.

Psalis (?) *picina* Kirby, 1891, Journ. Linn. Soc. London, Zoöl., XXIII, p. 516. ♂, ♀. Gambia.

Risimu, between Stanleyville and Bafwaboli, September 7, 1909; two males. Medje, July 15 to 28, 1910 and July, 1914; one female and one immature male. Niapu, January, 1914; one immature female. (Lang and Chapin.)



Figs. 17–18. *Euborellia cincticollis* (Gerstæcker). Males. Risimu, Belgian Congo.
Fig. 17. Tegmina and wings of alate type. Fig. 18. Tegmina of brachypterous type. All greatly enlarged.

The synonymy given above was established by Burr in 1909[1] and we fully concur in his action. At the same time he suggests the probability of Palisot's *Forficula rufescens*[2] representing the same species. This seems entirely unlikely, the long and relatively slender forceps given in the figure at once removing Palisot's insect from consideration.

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[1] 1909, Ann. Mag. Nat. Hist., (8) IV, p. 113.

[2] 'Ins. Rec. Afriq. Amér.,' p. 35, Orth. Pl. I, fig. 2. Oware, (present) southern Nigeria.

Burr, in the paper above mentioned, suggests that individuals with abbreviate tegmina and no wings, such as the type material of *cincticollis*, are immature forms of the species, the fully adult individuals of which have much more completely developed tegmina and evident wings, similar to the types of *picina*. Of the specimens before us, the male from Risimu possesses fully developed tegmina and wings, while the second male from the same locality and the female from Medje have no evident wings, the tegmina being not more than one-half as long as in the fully alate type and these appendages are obliquely concavo-truncate distad. In the abbreviate-tegmined individual[1] the metanotum has its caudal margin obtuse-angulate emarginate, the segment very faintly inflated and with a medio-longitudinal sulcus weakly or subobsoletely indicated. We do not feel that the abbreviate-tegmined individual represents an immature condition and prefer to consider the species dimorphic in the adult, in this respect similar to *Psalis americana*, to which genus the present species frequently has been referred. The Niapu specimen represents the instar preceding maturity and the male from Medje the second instar before maturity.

The forceps of the males are somewhat asymmetrical, the right branch being more sharply arcuate than the left one. The usual yellow spots on the tegmina are obsolete or subobsolete in all three adults.

The present species is one representative of the Western Forest Province, and the localities from which it has been recorded extend from the Gambia east to Masaka, Uganda, south to Stanley Pool, Congo.

Labidurinæ

LABIDURA Leach

1815, 'Edinburgh Encycl.,' IX, p. 118.

GENOTYPE.—*Labidura riparia* (*Forficula riparia* Pallas).

A single polymorphic species with several color types makes up the genus *Labidura* as found in the Old World. There exists, and will continue to exist until we have definite and conclusive evidence, great uncertainty as to the real value of the different forms which have been combined under the specific name *riparia*. We feel that, at this writing, the best course to follow is to combine them, largely because the forms overlap and intergrade to such an extent that it is virtually impossible to assign more than a portion of one's material to any of the named units, phases, or what-not. Kirby,[1] in 1903, made an effort to single out certain of these forms, but in a most incomplete and inconclusive way. Any effort to use his suggestions, for such they really are, leads one immediately into difficulty. We have examined some hundreds of individuals of *riparia* from various localities in the Old and New World, and we fail to find any constant and definite features upon which we can rely for separating the complex into definite species or varieties, either on marked morphological grounds or even less pronounced tendencies with geographic correlations. Certain definite tendencies in structure do exist, as abbreviation of wings, bidentate distal margin of last abdominal tergite in the male, lack of median tooth in the male forceps and dorsal curve of the forceps, while the size varies greatly. However, these features, which are probably genetic, are so inextricably tangled up that the use of names for them is clearly inadvisable at this time.

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[1] The original material described by Gerstæcker was of this type. The original description was based on both sexes, and not on the female alone, as Burr's comments on the Greifswald Dermaptera (1909, Ann. Mag. Nat. Hist., (8) III, p. 255) would lead one to suppose. It is quite incomprehensible how that author could write, "It is to be hoped that the male will be discovered soon, so that its true relations may be determined." Gerstæcker distinctly gives both sexes, measurements of both, and rather carefully describes the abdominal and forceps characters of the male.

The genus *Labidura* is of virtually world-wide distribution, but whether this distribution has been assisted by the human race is at present unknown. Personally, we are inclined to believe that man has had relatively little to do with its presence in many places. The absence of the genus from some extensive areas, such as a very large part of the western coast of the Americas, appears rather significant, but two records being known from that region, i.e., Panama City, Panama, and Chile. The latter record is rather indefinite, but we are using it to assist in illustrating our point. The absence of records from the western coast of the United States may be explained by the fact that *Labidura* prefers sandy regions and that coast is largely rocky, but in the Bermudas, which are coralline limestone islands, more rugged and broken than the western coast of the United States and with few or no sandy areas, the species is quite at home. In the eastern and southern United States the type species has a very limited distribution, apparently restricted to the sandy coastal plain and outlying islands, extending back from the coast region solely along the larger river valleys, and then only within the confines of the coastal plain. There is no record of its occurrence higher up the great Mississippi Valley than New Orleans, although for over one hundred years this has been one of the greatest avenues of commerce in the world. We are citing these comparative data to show that in regions as well studied as the south-eastern United States the distribution of *Labidura* is known to be very circumscribed. With these facts in view, its marked presence far up in the Congo basin and its relative absence, or at least scarcity, up the Amazon Valley are worthy of comparison. Arab traders, slave or goods caravans, may have played a part in this distribution in Africa, which is of at least fifteen years' standing, as evidenced by the records. However, the steady and regular water transport on the Amazon, continuously for several centuries, clearly presented a far more ready method of range extension if man was the chief factor involved.

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[1] Ann. Mag. Nat. Hist., (7) XI, pp. 64 to 68.

Labidura riparia (Pallas)

Forficula riparia Pallas, 1773, 'Reise Russischen Reichs,' II, Buch 2, Anhang, p. 727. ♂. Shores of the Irtysch (Irtin) River, western Siberia.

[*Forficula*] *pallipes* Fabricius, 1775, 'Syst. Entom.,' p. 270. ♂. Cape Verde Islands.

Forficula crenata Olivier, 1791, 'Encycl. Méthod.,' VI, p. 467. ♀. "Middle of Africa."

[*Forficula*] *flavipes* Fabricius, 1793, 'Entom. Syst.,' II, p. 2. (Sex?) Guinea.

Forficula rufescens Palisot de Beauvois, 1805, 'Ins. Rec. Afriq. Amér.,' p. 35, Orth. Pl. i, fig. 2. ♀. Wari (Oware), (present) southern Nigeria.

Forficelisa terminalis Serville, 1839, 'Hist. Nat. Ins., Orth.,' p. 25. ♂. Mauritius (Isle of France).

Labidura auditor Scudder, 1876, Proc. Boston Soc. Nat. Hist., XVIII, p. 252. ♂, ♀. Natal.

Apterygida huseinæ Rehn, 1901, Proc. Acad. Nat. Sci. Philadelphia, p. 273. ♂, ♀. Sheikh Husein, Abyssinia.

Garamba, July, 1912; one male. Faradje, April, 1911 and January, 1913; one female and three very immature specimens. Niangara, November, 1910; six males and two females. Niapu, January, 1914; one male and two females. Medje, January 22, 1910, September, 20 to 30, 1910 and June, 1914; two males and one immature specimen. Batama, September 16, 1909; one male and one immature specimen. Stanleyville, January and April, 1915; two males, three females, and five very immature specimens. Malela, July 5, 1915; one immature specimen. (Lang and Chapin.)

We are giving above the original references and the synonymy as based on African material. The full synonymy of this widely distributed and apparently polymorphic species is so extensive that it seems inadvisable to include more than the African synonyms. Of these two have not been so placed previously. These are *flavipes* Fabricius and *rufescens* Palisot de Beauvois. The position of these will be evident after examining the descriptions and Palisot's figure. The latter author's name has been considered to be a questionable synonym of *Euborellia cincticollis*, but its reference there is entirely without reason or evidence.

While adding two names to the synonymy we also remove two African forms which have been referred here by Burr,[1] as there is no justification for so placing them. These are *Labidura dubroni* and *L. karschi* Borg,[2] both of which are not only not referable to *Labidura*, but probably belong to the Labiidæ. The figure of *karschi* shows and the descriptions of both emphasize features which are not found in labidurine types.

For the present, at least, it seems most advisable to consider nearly all of the numerous form and color variations of the *Labidura riparia* complex as representatives of a single, widely distributed, very variable species. Future field work may show this to be incorrect and breeding experiments may demonstrate that genetic value should be attached to certain of these tendencies. Until such work has been done and the evidence presented, we have little reason for taking a position different from that here indicated.

The pale form, which has been called true *riparia*, is represented by two males and two females of the Stanleyville series, the Faradje female and one Niapu female. The dark-bodied type, which has been referred to frequently in the literature as *pallipes*, is represented by the Garamba male, nearly all of the Niangara series, a Medje male, the Niapu male and second female, and the Batama male. The third Stanleyville female, two males and a female from Niangara, and the second Medje male are nearer *pallipes*, but paler than the others.

In size the variation is most marked, the extremes of the series of males measuring (in millimeters) as follows:

	Niangara	Niangara	Medje
Length of Body	22.5	16.1	20.2
Length of Forceps	9.4	5.3	10.6
	Medje	Stanleyville	Stanleyville
Length of Body	17.1	20.4	18.5
Length of Forceps	7.8	8.5	6.8

The two females from Niangara are not comparable in body length, as one has had the abdomen much distended by the absorption of a liquid preservative, one of the Niapu females has lost its forceps, and the Stanleyville females are of very nearly the same size.

All of the adults show the wings projecting distad of the tegmina to a variable extent. In the Niangara males the paired teeth on the distal margin of the last abdominal tergite are distinctly present in all but one, almost completely absent in this, the smallest individual of that series.

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[1] 1911, 'Genera Insectorum, Dermaptera,' p. 36.

[2] 1904, *Labidura dubroni* Borg, Arkiv för Zoologi, I, p. 565. ♀. Cameroon. *Labidura karschi* Borg, idem, p. 566, Pl. xxvi, fig. 1. ♂, ♀. Cameroon.

In one Stanleyville male they are markedly present, in the other almost absent. In both Medje males these teeth are present, more decided in the larger individual; in the Garamba and Batama males they are present, and are present but very weak in the Niapu male, which is of very small size. In all the males the internal margin of the forceps shows a median tooth, although this varies in strength.

The distribution of this species in Africa is very extensive, virtually the only large areas of the continent from which we have no records being the Saharan region, Angola and Southwest Africa, and Portuguese and "German" East Africa (Tanganyika Territory). In all but the first area we feel this is due to the lack of definite information. *Labidura* is not a desert-loving form, although the presence of a river system or sea-coast will extend its distribution into arid regions.

Apachyidæ

Apachyus Serville

1831, Ann. Sci. Nat., XXII, p. 35.

Genotype.—*Apachyus depressus* (*Forficula depressa* Palisot de Beauvois). (Monotypic.)

This most peculiar genus and its relative *Dendroiketes*, from Ceylon, have been considered to constitute the family Apachyidæ, and this representative of a superfamily, the Paradermaptera. Burr, the leading authority on the Dermaptera, now prefers to cancel the superfamily and to treat the group as a family or even a subfamily.[1] It is, at any rate, one of the clearly cut groups, with a general facies which makes its immediate recognition possible. The body form is greatly modified, strongly depressed and, in fact, flattened, recalling that of the Sparattinæ, while the development of the remarkable squamo-pygidium, with its unusual median projection and simple sickle-shaped forceps, furnishes a very distinctive set of structures.

The Ceylonese *Dendroiketes* is an annectant type between the more specialized genus *Apachyus* and the more typical earwigs, having a simple rectangulate instead of much specialized and longitudinal pronotum, less depressed body and differences in the tarsal and abdominal structures.

All the information we have regarding the habits of species of this genus is to the effect that they live under the bark of dead trees, a habitat for which their flattened form admirably fits them.

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[1] 1915, Journ. Royal Microsc. Soc., p. 447. In this paper Burr seems uncertain of the status of the group. He first says, "Subfamily 7. Apachyidæ." Three lines below he says, "I . . . treat the Apachyidæ as a family of the Protodermaptera." The heading quoted above is equivalent in position and type with the other subfamilies, consecutively numbered and properly given with "næ" terminations, treated as subfamilies of the Labiduridæ. His intention can hardly be called clear, nor his treatment consistent.

The genus is known to occur in the Papuan and Oriental Regions, from New Guinea through the Sunda Islands to Tonkin, Burma, Assam, Sikkim, and Bhutan, and in the African Western Forest Province, extending into the Eastern and Southern Subprovince of the Savannah Province, and reaching the eastern coast of Africa at Beira, but being absent from Madagascar and the other islands of the Malagasy Region. The related genus *Dendroiketes,* as stated above, occurs only in Ceylon.

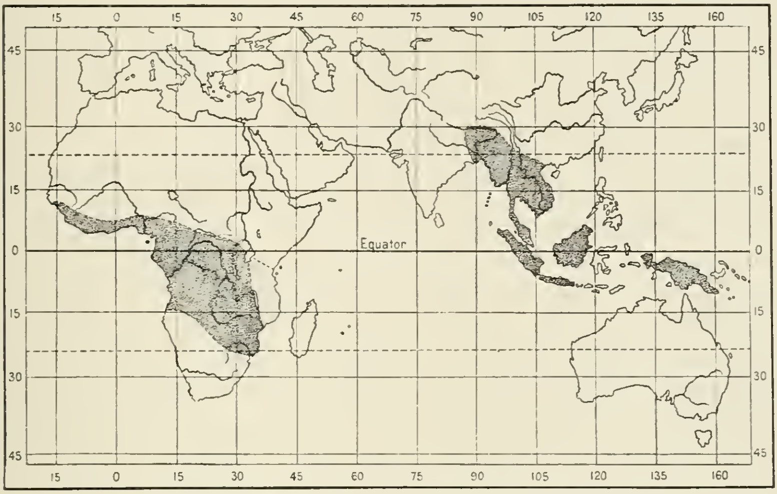

Fig. 19. Known distribution of the genus *Apachyus.*

In the Malayan Region it is more than probable that the genus will be found on a number of the islands not stippled here; but we have restricted ourselves to those from which actual records have been published. The light stippled area in eastern Africa is also an area of probable distribution, but we have no actual records from this section.

Key to the African Species of *Apachyus*

1. Form broader and heavier, more robust; size generally larger. Pronotum broader. Abdomen with moderate but evident expansion distad; width across anal segment decidedly greater than twice width of pronotum. Anal segment of male with produced section between forceps bases twice as broad as long, the serrulate margin in general broad and low arcuate; anal segment of female with proportions similar to those of male, the margin in general form arcuate obtuse-angulate. Forceps of both sexes with arms more strongly bowed, heavier proximad................*depressus* (Palisot de Beauvois).

Form more slender; size generally smaller. Pronotum more narrow. Abdomen subequal in width, hardly expanding at all distad; width across anal segment hardly or not at all greater than twice width of pronotum. Anal segment of male with produced section between forceps bases one and one-half times as broad as long, the serrulate margin arcuate obtuse-angulate; anal segment of female with proportions similar to those of male, the margin in general form crenulate subrectangulate. Forceps of both sexes with arms less strongly bowed, more slender proximad............*murrayi* Dohrn.

Apachyus depressus (Palisot de Beauvois)

Forficula depressa Palisot de Beauvois, 1805, 'Ins. Rec. Afriq. Amér.,' p. 36, Orth. Pl. i, fig. 5. ♂. Oware (present southern Nigeria, west of mouth of the Niger River), West Africa.

Apachya reichardi Karsch, 1886, Berlin. Entom. Zeitschr., XXX, p. 85, Pl. iii, fig. 3. ♂. "Eastern Central Africa, east of (Lake) Tanganyika, probably Kawande" (western "German" East Africa.)

Niangara, November , 1910; one male, one female, and three immature males. Akenge, October, 1913; one female. Medje, July 24 to September, 1910 and June and July, 1914; six males, three females, twelve immature males, and eleven immature females. Stanleyville, March, 1915; one male. (Lang and Chapin.)

The synonymy of *reichardi* given above appears to us to be the proper disposition to make of the name. It has, apparently, no claim to be considered distinct from *depressus,* the general size and colorational features originally cited having no value as differential characters. Burr[1] leaves the matter rather in suspense by giving *depressus, murrayi,* and *reichardi* as geographic forms of a single species. We have shown above in the key to the African species of the genus, and below under *murrayi,* that we do not agree with this treatment, *murrayi* clearly not being a geographic race, while *reichardi* certainly equals Palisot's far older *depressus.* The color features there given by Burr appear to us to have little significance, although certain points of the abdominal coloring may be of real assistance in recognizing the two species here treated.

The present series shows very great variation in size in adults of both sexes, and in the males from Medje alone the differences are decided. Representative material shows the following body length, exclusive of the forceps, in millimeters.

	Niangara	Medje	Medje	
♂	24.7	22.4	25.0	
			Akenge	Stanleyville
♀	21.0	24.6	22.4	24.2

In coloration the adult specimens before us show almost no noteworthy features. In all, the internal section of the folded wings is pale yellowish and the pronotum is unicolorous, with the tegmina except for an occasional weak paling mesad. In no specimen is the pronotum bordered with pale color. The scutellum varies slightly in depth of coloration, much the same as the pronotum. The immature specimens are largely gamboge yellow in their younger instars, darkening and becoming more contrastingly colored as they develop.

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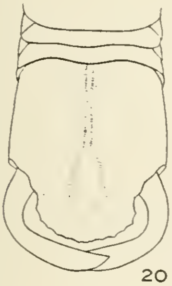
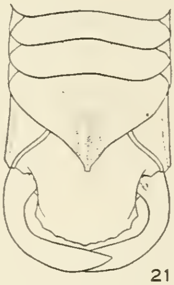
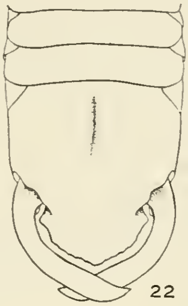
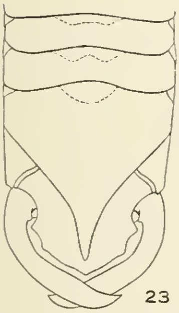
[1] 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Zool., Lief. 16, p. 457.

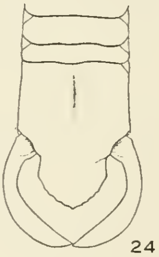
The anal segment of the adult male shows no variation in its shape or that of the production of the segment. The female shows equal fixity in the character of the anal segment.

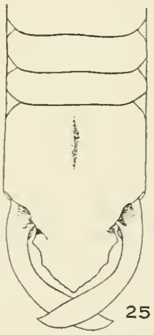












Figs. 20–23. *Apachyus depressus* (Palisot de Beauvois).

Fig. 20. Male. Niangara, Belgian Congo. Dorsal surface of apex of abdomen. ×4. Fig. 21. Ventral surface of apex of abdomen of the same, ×4. Fig. 22. Female. Medje, Belgian Congo. Dorsal surface of apex of abdomen, ×4½. Fig. 23. Ventral surface of apex of abdomen of the same, ×4½.

Figs. 24–25. *Apachyus murrayi* Dohrn.

Fig. 24. Male. Medje, Belgian Congo. Dorsal surface of abdomen, ×4½. Fig. 25. Female. Stanleyville, Belgian Congo. Dorsal surface of abdomen, ×5½.

The immature specimens appear to represent at least three instars preceding maturity. In these the production of the anal segment is similar in both sexes, being a lanceolate linguiform projection with crenulate edges. When the ventral surface is examined a distinct difference in the sexes is noted. In the male in the youngest instar the eighth sternite is broadly and regularly arcuate, the two preceding ones with their margins concave mesad. In the next instar of the same sex the eighth sternite has the margin obtuse-angulate produced, the two preceding segments with their concavity much less evident. In the instar preceding maturity in the male the eighth sternite is more markedly obtuse-angulate with the sides of the angle weakly concave and the apex with a bifid tendency. As Burr already has pointed out,[1] eight sternites are distinctly visible in the immature female of this genus. In the female sex we have but two instars preceding maturity represented. In the earlier of these the sixth sternite has its margin very weakly angulate produced mesad, the seventh is concavo-truncate distad and the eighth is broadly and shallowly arcuate. In the instar preceding maturity in the female the sixth sternite has the production more pronounced, acute,

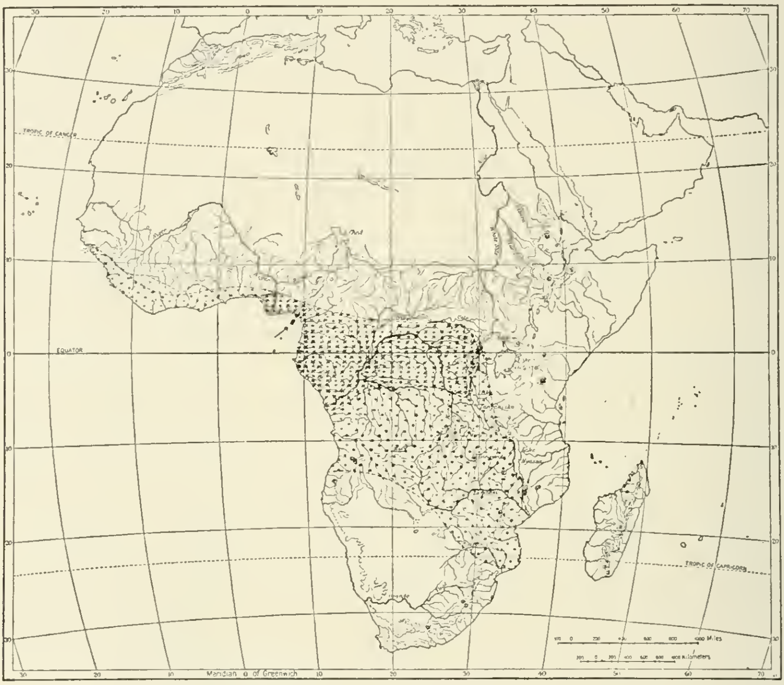


Fig. 26. Known distribution of *Apachyus depressus* (dots) and *A. murrayi* (crosses).

It is evident that *murrayi* has a much more circumscribed distribution than *depressus*, the former being a strictly Western Forest Province form, while *depressus* has maintained or achieved a greater distributional area, probably by a more ready adaptability.

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[1] 1910, 'Fauna Brit. India, Dermapt.,' p. 34.

reaching nearly to the margin of the seventh sternite, the sides of the angle concave, the seventh sternite with its margin concave mesad, arcuate laterad, eighth sternite low arcuato-obtuse-angulate. Definite wing-venational indications are to be seen in the two instars preceding maturity.

The area of distribution of this species covers virtually all of the Western Forest Province and portions of the Eastern and Southern Subprovince of Engler. It is known to occur from the Rio Cassini, Portuguese Guinea, to the north-eastern Belgian Congo (localities here given and from between Ukaika and Mawambi) and western "German" East Africa (Kawende), south to Benguela, northeastern Transvaal (Zoutpansberg) and central Portuguese East Africa (Beira). It also has been specifically recorded from Mount Coffee, Liberia; Assinie, Ivory Coast; Aburi, Gold Coast; Oware, southern Nigeria; Mundame, Cameroon; Cape San Juan, Biafra; Lambarené, Fernand Vaz, and Nkogo, French Congo, as well as from the island of Fernando Po.

Apachyus murrayi Dohrn

A[pachyus] murrayi Dohrn, 1863, Stettin. Entom. Zeitung, XXIV, p. 44. Sex? Old Calabar, West Africa.

Medje, July, 1914; one male. Stanleyville, March, 1915; one female. (Lang and Chapin.)

In addition to these specimens we have an adult female and an immature female from Bitye, Dja River, Cameroon, in the collection of the Academy of Natural Sciences of Philadelphia, which are identical with the specimens from the north-eastern Belgian Congo. As we have stated above under *depressus*, we do not consider these names to represent forms of the same species, but instead distinct species. Burr considers *murrayi* to be a West African race or form of a single species comprising all the described African *Apachyus*. The present material shows that *murrayi* ranges to the north-eastern Belgian Congo, occurs with *A. depressus*, and differs constantly in structural features, also exhibits no difference between specimens from the north-eastern Belgian Congo and those from the southern Cameroon.

In the key to the species given above under the generic discussion, we have presented the salient features for distinguishing *A. murrayi* from *A. depressus*, and in addition to those the following less evident but still useful features have been observed.

In *murrayi* the eyes are slightly smaller in proportion to the postocular portion of the head, and also slightly more prominent.

The dark suffusion of the dorsal and lateral surfaces of the base of the abdomen is more broadly distributed over the segments involved in *depressus,* while in *murrayi* the sides and lateral portions of the dorsum of the segments only are involved.

In *murrayi* the more elongate produced portion of the anal segment and the more slender form of the whole insect gives to the anal segment a more elongate facies in *murrayi* than in *depressus,* this more evident in the male than in the female sex.

The specimens before us measure as follows in body length (exclusive of forceps): ♂, Medje, Belgian Congo, 21 mm.; ♀, Stanleyville, Belgian Congo, 19.6; ♀, Bitye, Cameroon, 22.5.

We find no noteworthy color or structural variational differences in our material. The immature female from Bitye is in the instar preceding maturity and the development of its distal sternites is much as in the same instar of *depressus,* the eighth, however, with its margin more regularly arcuate. The produced portion of the anal segment in the same specimen is slightly more acute and lanceolate than in *depressus.*

As far as our present knowledge of the distribution of this species goes it covers a more restricted area than that of *A. depressus,* the present form not being found outside of the Western Forest Province. It is known from localities extending from Southern Nigeria (Old Calabar and Olokemeji) east to Lake Kivu and the north-eastern Belgian Congo (Medje and Avakubi), and from as far north as Medje, Belgian Congo, and from the Nigerian localities south to the Lower Congo (Luki and Stanley Pool). Its distributional limits on the southeast are completely unknown.

EUDERMAPTERA

Labiidæ

Labiinæ

LABIA Leach

1815, 'Edinburgh Encycl.,' IX, p. 118.

GENOTYPE.—*Labia minor* (*Forficula minor* Linnæus).

This genus is composed of more than fifty species of uniformly small earwigs, occasionally of striking coloration, but often difficult to distinguish satisfactorily, as the variation in the species is not as clearly understood as is necessary for permanent critical work. This variation is not limited to coloration, but is known also to be structural in certain species, as in the nearly circumtropical *L. curvicauda.* Many of the described species are at present virtually unrecognizable on account of the insufficient character of their descriptions. Two species of the genus are widely distributed, *L. minor* being nearly cosmopolitan and very probably distributed by the agency of man, while *L. curvicauda* is virtually circumtropical in its distribution, and man may have been an influencing factor in the distribution of this species as well as in the case of *minor*.

Sixteen species of the genus are known from Africa with Madagascar, the Comoros, and the Seychelles. Of these, but three have been recorded from the Belgian Congo, i.e., *Labia minor*, *L. ochropus*, and *L. owenii*, but there can be no question of the occurrence in that territory of quite a few other species described from West African localities.

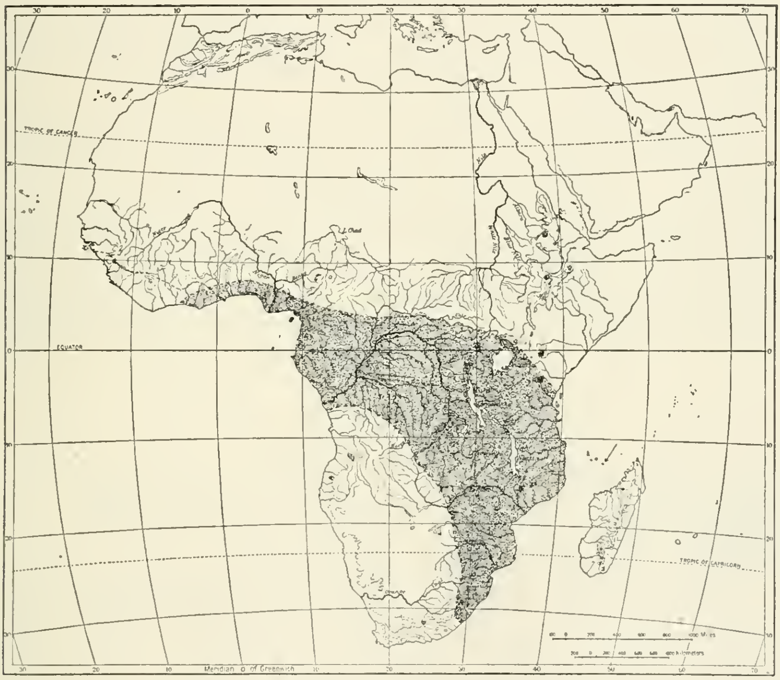

Fig. 27. Known distribution of *Labia ochropus*.

Labia ochropus (Stål)

F[orficula] ochropus Stål, 1855, Öfv. Kongl. Vetensk.-Akad. Förhandl., XII, p. 348. ♂, ♀. Port Natal (Durban), Natal.

Bengamisa, September 29, 1914; one female. (Lang and Chapin.)

This widely distributed African species has been referred to in a number of publications as *Labia marginalis* (Thunberg),[1] but we do not feel warranted in using this name for the specimen before us. The Bengamisa female fully agrees with the description of *ochropus* and its interpretation by subsequent authors, while it does not answer Thunberg's very brief description. In such a case it appears best to use the later but clearly applicable name. The species is said to be variable in coloration, but the real extent of the variation has not been recorded.

The present specimen has the head, pronotum, tegmina, and abdomen uniform pitch-brown, while the exposed portions of the wings are honey-yellow, margined along the sutural margins and more broadly their apices with pitch-brown. The antennæ are yellow with the following exceptions: first and second joints, which are strongly, and the third much less decidedly pitch-brown, joints ten to fourteen pitch-brown. Limbs honey-yellow with the femora clouded proximad with pitch-brown. The forceps are ferruginous.

The species is known to inhabit much of the Western Forest Province and the greater part of the Eastern and Southern Subprovince, having been reported from localities extending from Assinie, Ivory Coast and Fernand Vaz, French Congo to Tanga, "German" East Africa (Tanganyika Territory), and from as far north as these localities and Buta (Rubi), Belgian Congo, south to Natal, also occurring on the island of Mayotte in the Comoros. The records from the Belgian Congo are Leopoldville, Buta on the Rubi River, and the present one.

Chelisochidæ

CHELISOCHES Scudder

Lobophora SERVILLE, 1839, 'Hist. Nat. Ins., Orth.,' p. 32. (Not of Curtis, 1825.)
Chelisoches SCUDDER, 1876, Proc. Boston Soc. Nat. Hist., XVIII, p. 295.
Enkrates BURR, 1907, Trans. Entom. Soc. London, p. 131.

GENOTYPE.—*Lobophora rufitarsis* (=*Forficula morio* Fabricius). (Monotypic.)

It was necessary to replace the first generic name proposed for this group on account of its preoccupation in Lepidoptera. This Scudder properly did by substituting *Chelisoches* for *Lobophora*. Burr's name *Enkrates* has an unfortunate history, wholly due to the misidentification of his genotypic species. After the original description of his new genus, which is that of a distinct and clearly recognizable one, he states: "The only known species is *Enkrates flavipennis* Fabr., from West Africa, of which the synonymy is rather confused." After this follows the synonymy, headed by the reference to Fabricius' *Forficula flavipennis*. The difficulty here is, that *flavipennis* Fabricius is not a member of the genus described by Burr, but it is the oldest name for the chelisochid called *plagiata* by Fairmaire in 1858. We are discussing this identification below. The designation of the genotype and the citation of the author of the same is the last resort in the fixing of a generic name and, in consequence, Burr's name *Enkrates* must be placed, albeit very unwillingly by us, as a synonym of *Chelisoches*. We are elsewhere proposing a new generic name for the species which Burr had misidentified as *flavipennis* Fabricius.

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[1] *F[orficula] marginalis* Thunberg, 1827, Nova Acta Reg. Soc. Scient. Upsal., IX, p. 52. Sex? Cape (of Good Hope).

The present genus, like the whole family to which it belongs, is of Old World origin, but the genotype, *C. morio*, is a very adaptable species which apparently has been transported by commerce to such an extent that it is now established in the Hawaiian Islands and in California. The majority of the ten or so species of the genus are Oriental or Australasian, and the genus reaches its greatest diversity in the Sunda Islands.

From the African continent but two species are known. One of these two African species is *C. morio*, the widely distributed and adaptable genotypic species of the genus. In Africa it is known only from several localities in Usambara, "German" East Africa (Tanganyika Territory), and the vicinity of Mombasa, where it was probably accidentally transported, while it also occurs in Madagascar and the Comoros, as well as north of Madagascar on the Farquhar Atoll.

Key to the Species of *Chelisoches* of the African Mainland

1. Body coloration uniformly brownish black. Pronotum subquadrate, lateral margins very weakly diverging caudad. Male forceps elongate, not abruptly differentiated into very robust proximal and more slender distal portions. *morio* (Fabricius).

   Body coloration variegated, yellow, red-brown, ivory-white, and pitch-black. Pronotum longitudinal, lateral margins markedly diverging caudad. Male forceps short, very abruptly differentiated into a broad, sublamellate proximal portion and a more slender, tapering, arcuate distal portion. *flavipennis* (Fabricius).

Chelisoches flavipennis (Fabricius)

[*Forficula*] *flavipennis* Fabricius, 1793, 'Entom. Syst.,' II, p. 5. Sex? Senegal.
Forficula plagiata Fairmaire, 1858, in Thomson, 'Archives Entom.,' II, p. 257, Pl. IX, fig. 3. ♀. Gaboon (West Africa).

Medje, April to September, 1910 to 1914; two males and five females. Stanleyville, April, 1915; one male. (Lang and Chapin.)

As we have stated above under the generic discussion, Fabricius' *flavipennis* has been misidentified by Burr, and this misidentification has resulted in the synonymy of the generic name *Enkrates*. Fabricius' description is as follows:

> F. nigra elytris flavescentibus: sutura nigra.
>
> Media. Caput obscure rufum macula frontali nigra. Thorax marginatus, nigricans.
>
> Elytra flava sutura communi nigra. Corpus nigrum pedibus flavis.

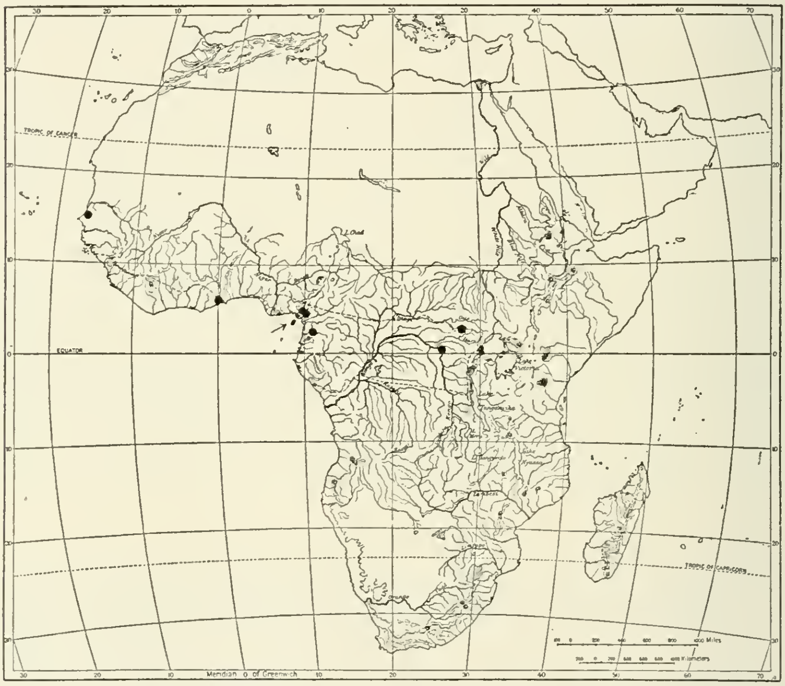

Fig. 28. Locations of known records of *Chelisoches flavipennis* (Fabricius). The "Senegal" record may refer to some point considerably to the south of the present Senegal, which is here indicated.

Of these features two are as found in that species later described by Fairmaire as *plagiata*, while in the species to which Burr referred the name *flavipennis*, i.e., that for which Kirby's name *variegata* is available, they are quite different. The head is solid red in *variegata*, and is red with the frontal portion black in the species named by Fairmaire. In *variegata* the tegmina (i.e. elytra) are yellow with two dark longitudinal bars, the sutural margins of the tegmina being yellow; in *plagiata* of

Fairmaire the tegmina are clear yellow with the proximal half of the sutural tegminal margins blackish. With both species before us there is no question in our mind as to which is really Fabricius' *flavipennis*. Unfortunately, the correct interpretation disturbs some accepted generic and specific names, but a careful examination of the original description would have prevented the error, which must be corrected.

This striking and distinctively colored species was very well figured in colors by Fairmaire. It can at once be distinguished from the other species of the genus known from Africa, *C. morio*, by its markedly contrasted pattern of yellow, red-brown, ivory-white, and pitch-black.

In general size the present material shows some variation, the extremes (in millimeters) being as follows:

	♂ Stanleyville	♂ Medje	♀ Medje	♀[1] Medje
Length of Body	13.0	15.8	14.0	16.0
Length of Forceps	4.2	4.2	5.3	6.5

The perfect antennæ vary in having from seventeen to eighteen joints. The distal pale annulus of the antennæ is always made up of two segments, which may be the twelfth and thirteenth or the thirteenth and fourteenth. In one specimen, on one antenna, the distal pale segment is blackish distad.

In its distribution this species is probably a West African Forest Province form, ranging from Senegal and the Gold Coast (Aburi) to the north-eastern Belgian Congo (Stanleyville and Medje). It is possible that "Senegal" as understood by Fabricius embraced much of the country to the south of the present Senegal, and thus within the Forest Province. The species also occurs on the island of Fernando Po.

Forficulidæ

Forficulinæ

FORFICULA Linnæus

1758, 'Syst. Nat.,' 10th Ed., p. 423.

GENOTYPE.—*Forficula auricularia* Linnæus. (By indication of Rehn, 1903.)

This genus embraces what might be called the most representative group of Old World earwigs, one or more species being found native in most areas of the hemisphere except Australasia. One species, the genotype, is found as an introduction in North America and portions of Australasia.

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[1] There is another Medje female which has the body longer than the measured maximum, but we refrain from giving its proportions as its body apparently has been distended by the absorption of fluid in which it was originally preserved. The forceps of the distended specimen are equal in length to those of the maximum female here measured.

Nearly fifty species are known to belong to the genus as now restricted, and of these fourteen have been recorded from Africa and the adjacent islands. The Eurasian influence is very strong in this genus as found in Africa, as seven of the fourteen species are restricted in their distribution to Mediterranean North Africa, several of these being European forms, while a few of those of more Ethiopian distribution in Africa are extremely local in their occurrence. One species (*F. redempta* Burr) is peculiar to the island of Sokotra, while another (*F. sjöstedti* Burr) is restricted to relatively high elevations in East Africa, occurring on Kilimanjaro, Kenya, the Aberdare Mountains, and also on the Ufumbiro Volcanoes very close to, if not within, the borders of the Belgian Congo.

Three species of the genus are now known to occur within the Belgian Congo, and one other certainly within a few miles of the boundary in "German" East Africa (Tanganyika Territory) (*sjöstedti*, vide supra). Two of the species are here reported for the first time from the territory we are considering, while *F. rodziankoi* has been recorded from Kasindi, within the Belgian Congo, on Lake Albert Edward, and from the western slope of Ruwenzori at an elevation of about 2500 meters. The same species has also been reported from an elevation of 3000 meters on Ninagongo, Ufumbiro Volcanoes, in the Belgian Congo.

Key to the Species of *Forficula* found in the Region of the Belgian Congo

1. Tegmina fully developed, nearly or quite twice as long as the pronotum; distal margin of tegmina obliquely arcuate truncate, the point of the tegmina sutural in position. Wings evident, well developed....................2.

   Tegmina abbreviate, one to one and one-half times as long as pronotum; distal margin of tegmina oblique truncate, the point of the tegmina costal in position. Wings aborted, not evident[1]....................................3.

2. Pronotum with the lateral margins appreciably arcuate; pronotum in form moderately transverse. Forceps of male with proximal expansion of internal margin short; distad of this section the branches are forcipate, gently arcuate, the tips crossing; in macrolabic form the forceps are longer than body. Forceps of female more slender................*brolemanni* Borelli.

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[1] Since preparing this key I have found that Burr (1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped. 1907–1908,' III, Zool., Lief. 16, p. 459) states that *F. rodziankoi* occurs both winged and wingless. Borelli has also stated recently (1915 'Résultats Scientif. Voy. Alluaud et Jeannel en Afriq. Orient. (1911–1912), Orth.,' 1, p. 15), that *senegalensis* occurs with tegmina and wings more abbreviate than in the typical condition. Without material of *rodziankoi* or *sjöstedti* before me I can do no more than build a table from the literature, utilizing solely the most apparent features. However, *rodziankoi* needs comparison solely with *F. senegalensis*, being well removed from *brolemanni* and *sjöstedti*. Semenoff's species may prove to be extremely close to *senegalensis*. Burr's *sjöstedti* is a localized mountain species with extremely abbreviate tegmina and very distinctive forceps.

Pronotum with the lateral margins subparallel, hardly at all arcuate; pronotum in form subquadrate. Forceps of male with proximal expansion of internal margin elongate, equal to or more than one-half of the length of forceps; distad of this section the branches are caliper-like, distinctly arcuate, the tips not crossing; in macrolabic form the forceps are equal to about two-thirds of body length. Forceps of female more robust. . *senegalensis* Serville.

3. Pronotum with caudal margin gently arcuate. Tegmina bicolored. Pygidium of male abbreviate. Forceps of male with proximal lamellation of internal margin equal to more than one-half of forceps' length. . *rodziankoi* Semenoff.

Pronotum with caudal margin strongly and broadly arcuate. Tegmina unicolored. Pygidium of male elongate, linguiform. Forceps of male with proximal lamellation of internal margin less than one-half of the length of the forceps. *sjöstedti* Burr.

Forficula brolemanni Borelli

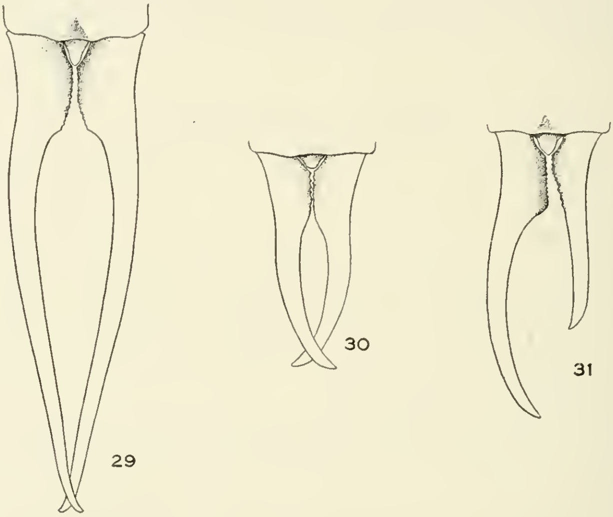
Forficula brolemanni Borelli, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 573, p. 1, fig. ♂, ♀. Bougounni (Bougouni or Buguni), [Upper Senegal, French] Sudan.

Garamba, July, 1912; two females. Faradje, January, 1912 and 1913; February to April, 1912; March, 1911; March to April, 1911; April, 1911; December 6, 1912; twenty-eight males, twenty-three females. Vankerckhovenville, April, 1912; eight males, nine females. Medje, January 22, 1910; two males. Stanleyville, January, 1915; one female. (All Lang and Chapin.)

This is the second record of the present species since its description. The original description is very full and typical material (i.e., macrolabic individuals) fully accord with the features given by Borelli.

The present series shows that *brolemanni* has decidedly different macrolabic and brachylabic forms in the male sex of material taken at the same locality corresponding to those found in *E. auricularia* and numerous other species. Borelli (1915, 'Résultats Scientif. Voy. Alluaud and Jeannel en Afriq. Orient., Orth.,' I, p. 15), would lead one to infer that such differences might be geographic, but the present series shows such is not the case. The macrolabic type is that originally described, the length of the forceps in this extreme being equal to two-thirds or more of the body length, the elongation of the slender distal section being proportionately greater than that of the subcontiguous, lamellate proximal portions, when compared with the brachylabic extreme. The latter (called cyclolabic by Borelli) has the forceps no longer than the tegmina, the proximal lamellate section is less sharply differentiated from the tapering distal section and the same section is also less markedly depressed. The two extremes appear very different, but they are fully connected by intermediate individuals in the present series.

The parallelism with the dimorphism found in the males of *F. auricularia* is also evident in the less pronounced sculpture of the disto-dorsal abdominal segment of the brachylabic individuals of *brolemanni*. The Vankerckhovenville series of males are all macrolabic except one, which is nearly intermediate, while the two Medje males are very similar. The bulk of the macrolabic, all of the brachylabic, and the greater portion of the intermediate specimens are contained in the Faradje series.



Figs. 29–31. *Forficula brolemanni* Borelli. Males.

Fig. 29. Vankerckhovenville, Belgian Congo. Macrolabic type of forceps, × 6. Fig. 30. Faradje, Belgian Congo. Brachylabic type of forceps, ×8. Fig. 31. Faradje, Belgian Congo. Abnormal forceps, ×6.

Measurements (in millimeters) of representative Faradje individuals follow.

	♂ (macrolabic)	♂ (macrolabic)	♂ (brachylabic)	♂ (brachylabic)
Length of Body (Exclusive of Forceps)	12.9	9.7	11.6	10.2
Length of Forceps	10.2	7.6	4.2	3.7
			♀	♀
Length of Body (Exclusive of Forceps)			11.6	10.5
Length of Forceps			3.2	3.1

All of the specimens before us have the wings well developed, although varying somewhat in the length of the exposed portion of the same. One macrolabic Faradje male shows abortion of the dextral arm of the forceps. In this the aborted branch is less than half as long as the perfect sinistral arm, the apex is blunt, and the proximal dilation is but little altered. Another Faradje male has the sinistral branch of the forceps normal male in type and approaching the macrolabic condition, while the dextral branch is of the form found in the female, but slightly more robust and longer than in similarly sized females, the internal margin proximad with crenulations much like those of normal male forceps, although no expansion is present (see Fig. 31). In every other way this specimen is a normal male.

In coloration the Vankerckhovenville series averages slightly darker in general tone than that from Faradje.

The species is now known to range across the Sudanese region from Upper Senegal (Bougounni) to the north-eastern Belgian Congo (Garamba), and western Uganda (Unyoro), extending southward into the Forest Province in the Belgian Congo as far as Stanleyville (see Fig. 32).

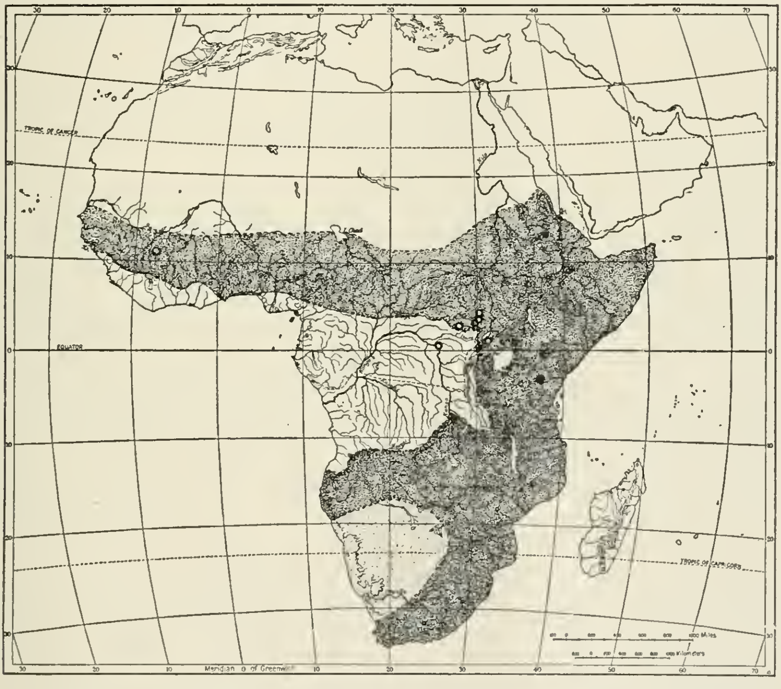


Fig. 32. Area of known distribution of *Forficula senegalensis* indicated by heavy stippling; area of possible but unproven occurrence indicated by light stippling. Localities from which *Forficula brolemanni* is known are indicated by circles.

Forficula senegalensis Serville

Forficula senegalensis SERVILLE, 1839, 'Hist. Nat. Ins., Orth.,' p. 39. ♂, ♀. Senegal.

Medje, January 22, 1910; one male. (Lang and Chapin.)

This specimen has been compared with material of the species from several localities in the Transvaal and found to be inseparable. The forceps in form are nearer the brachylabic than the macrolabic type, the proximal lamellate dilation of the internal margin comprising slightly more than one-half the length of the forceps, while the length of the forceps is subequal to that of the pronotum, tegmina, and exposed portion of the tegmina combined.

This species is widely distributed in Africa, although virtually absent from the Western Forest Province. It is a form of the Savannah Province, being found from Senegal to Kordofan, Eritrea, and Abyssinia, southward in eastern Africa to the Cape of Good Hope, and also in the Cape Verde Islands. The Medje record is the only one we are aware of from within the Forest Province. This probably represents an extension of range into forest conditions or an accidental introduction from the country to the north.

Opisthocosmiinæ

OPISTHOCOSMIA Dohrn

1865, Stettin. Entom. Zeitung, XXVI, p. 76.

GENOTYPE.—*Opisthocosmia centurio* Dohrn. (By designation of Rehn, 1903.)[1]

The genus *Opisthocosmia*, as now limited, contains but four species, of which three are Oriental and one African. There exists a possibility that the African species is not congeneric with the genotype of *Opisthocosmia*, but we are not in a position to investigate this further, as no material of the Oriental species is available for study. The African species is represented in The American Museum of Natural History Congo Collection, and we are, tentatively at least, permitting it to remain in Dohrn's genus.

The range of the genus embraces Borneo, Sumatra, and Siam in the Oriental Region, and Central Africa.

Opisthocosmia pœcilocera (Borg)

Ancistrogaster pœcilocera BORG, 1904, Arkiv för Zoologi, I, p. 577, Pl. XXVI, figs. 8 and 8*a*. ♀. Cameroon.

Opisthocosmia formosa BURR, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 492. ♂. Cameroon.

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[1] 1903, Proc. Acad. Nat. Sci. Philadelphia, p. 308.

Faradje, February to April, 1912; two males. (Lang and Chapin.)

This synonymy was established by Burr. The description of *formosa* is contradictory in certain features used in describing the male forceps, and its measurements of the same are clearly erroneous, i.e., 7.5 mm., with the body length given as 9 mm.[1]

Borelli has given[2] some useful comments on the color variation in this species, also very important notes on the structure of the male forceps, while Burr in several papers has emphasized the variation in coloration of the tegmina.

The two specimens show very decided differences in the form of the forceps. In one individual (Fig. 33) they are moderately robust at the base, the internal margins are arcuate sublamellate in the proximal third and appreciably crenulate; distad of this section the arms of the forceps are arcuate toward and crossing one another, rounded in section in the median third, the external margin convex, the internal concave; at distal third the internal margin has a distinct, flattened, lobiform tooth; distad of this the arms of the forceps are weakly falcate to the acuminate apices. The other type has the forceps somewhat more slender, tapering, straight and subparallel in the proximal half, then gently and regularly falcato-arcuate toward and crossing one another, the apices acute; internal margin in proximal third serrulate; no apparent indication of tooth at distal third. In both types the forceps are seen, in profile, to be curved dorsad in distal two-thirds, the tips very faintly decurved. There is no question in my mind as to the specific identity of the two specimens, but to aid future workers details have been given above.

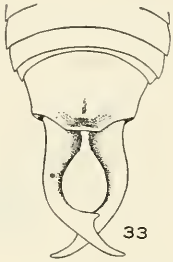

Fig. 33. *Opisthocosmia pœcilocera* (Borg). Male. Faradje, Congo.
Apex of abdomen from dorsum, ×9.

In size the individuals are rather small, the body length being 8.5 mm. in one (i.e., first described type of forceps) and 7.4 in the other (with second type of forceps), the forceps measuring 2.4 mm. in length in both specimens.

Regarding coloration we would note that both specimens have the tegmina uniformly dark fuscous, with no trace of the humeral pale maculation occasionally found (see Burr). The exposed portions of the wings are yellowish with the sutural section broadly longitudinally margined with

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[1] Borelli later, in measuring the species, gave the forceps length of the male as three millimeters, which is more in accordance with the present material and with Borg's dimensions of the female forceps (i.e., 3 mm.). Probably Burr's figure is an error for 2.5 or 3.5.

[2] 1907, Ann. Mus. Civ. Stor. Nat. Genova, XLIII, p. 385.

fuscous. The antennæ in both of the specimens are too imperfect for us to note the distribution of coloration on the respective segments, which is a feature apparently showing some variation in the species.

In distribution the species is known to range directly across Central Africa, from Portuguese Guinea (Bolama) on the west to Amani, "German" East Africa (Tanganyika Territory), on the east, south as far as north-western Tanganyika and Amani, north to Portuguese Guinea, Cameroon and the north-eastern Belgian Congo (Faradje). It is doubtless a type of forest origin, its presence at Amani probably governed by the Usambara mountain forest, and at Faradje its occurrence may be explained as an extension from forest conditions.

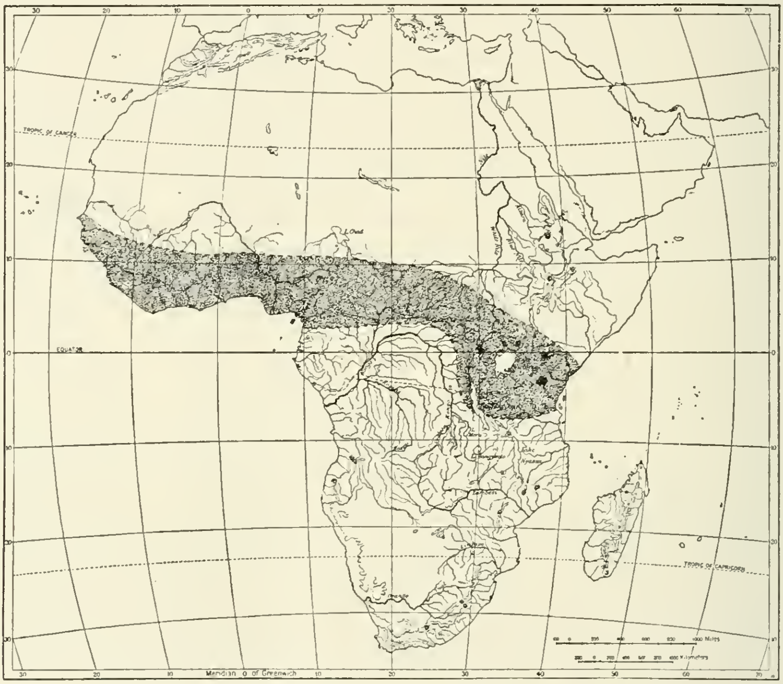


Fig. 34. Area of distribution of *Opisthocosmia pœcilocera.*

Thalperus Burr

1911, 'Genera Insectorum, Dermaptera,' pp. 89, 92.

Genotype.—*T. kuhlgatzi* (Burr). (By original designation.)

The genus *Thalperus* is one of the two genera of the Opisthocosmiinæ, a group which reaches its maximum development in the Oriental

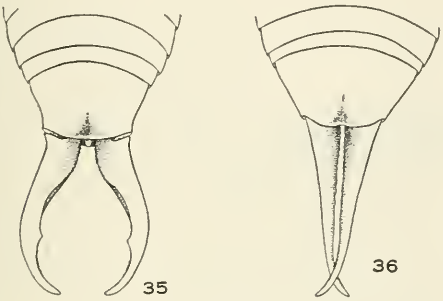
Region, known to occur on the African mainland. Four species of the genus have been described, one from Madagascar, *T. ova*[1] (Bormans), and three from the mainland of Africa, *T. kuhlgatzi, roccatii,* and *micheli*.[2] Of the three latter species two are included in the present series.

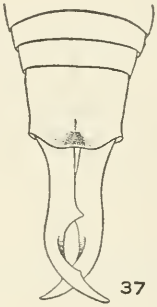
Thalperus kuhlgatzi (Burr)

Hypurgus sp. n. Burr, 1907, Deutsche Entom. Zeitschr., p. 487. ♀. Togo; Cameroon.

Hypurgus kuhlgatzi Burr, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 116. ♂, ♀. Togo; Bismarckburg, Togo (type locality[3]); Cameroon.

Faradje, January, 1913; March, 1911; three males, one female. (Lang and Chapin.)





Figs. 35–36. *Thalperus kuhlgatzi* (Burr).

Fig. 35. Male. Faradje, Belgian Congo. Apex of abdomen from dorsum, ×7. Fig. 36. Female. Faradje, Belgian Congo. Apex of abdomen from dorsum, ×8.

Fig. 37. *Thalperus roccatii* (Borelli). Male. Medje, Belgian Congo. Apex of abdomen from dorsum, ×7½.

The original description of this species is very imperfect, with numerous typographical errors and contradictions in the diagnosis and the detailed description. We feel satisfied, however, in the reference of the present material to this species.

All three specimens have the wings well developed, projecting distad of the tegmina a distance subequal to one-half the tegminal length. The original material was described as having the "wings abbreviate," from which we presume they were not normally exposed in those Burr had before him. We feel that the alate condition of the present series indi-

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[1] This name is generally written in the amended form *hova*, but it appears as *ova* in the original description and also in the explanation of the plates of the same paper (1883, Ann. Soc. Entom. Belgique, XXVII, pp. 80, 90). It seems best to us to use the original spelling.

[2] 1904, Trans. Entom. Soc. London, pp. 303, 307. ♂, ♀. Abyssinia.

[3] Selected as the type locality as it is the only original locality represented by the male sex, which in this species possesses more distinctive characters than the female.

cates nothing more than the presence of dimorphism in wing development in the species. The antennæ are described as having "about 10 segments." The March male is the only specimen we have with the antennæ complete and the number present in this specimen is twelve.

The arms of the male forceps may or may not have a distinct tooth present at the distal third. In the March male this is decided in its indication, as is true of one of the January males, while the other one has but the faintest swelling of the margin to indicate the position of the usual tooth. The forceps of the same sex have the proximal half of the internal margin faintly lamellate and very faintly serrulate, there being in addition a faint serrulation of the same margin distad of the distal tooth, when the latter is present. The figure of the forceps (Fig. 35) well illustrates their character.

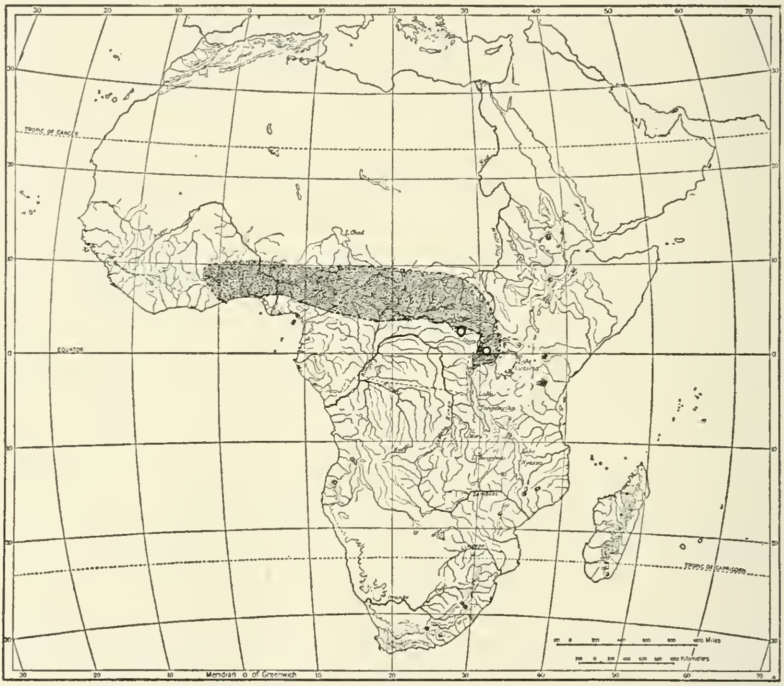

Fig. 38. Probable area of distribution of *Thalperus kuhlgatzi* indicated by stipple. Localities from which *Thalperus roccatii* is known are indicated by circles.

The species is apparently a Sudanese one, not entering the Forest Region as far as the exact records for it show. It has been recorded from

Togo and Cameroon without further details, while it has been definitely recorded from Bismarckburg, Togo, and Kirima on the north-western coast of Lake Albert Edward. These localities with the present Faradje record give our total knowledge of the species' distribution. Kirima is east of the eastern edge of the Congo forest, Bismarckburg is outside of the Rain Forest, while we have no knowledge of the portion of Cameroon to which the general record applies.

Thalperus roccatii (Borelli)

Opisthocosmia roccatii Borelli, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 541, p. 2. ♂, ♀. Ibanda, east side of Ruwenzori, Uganda.

Opisthocosmia roccatii Borelli, 1909, in Luigi Amedeo Duca Abruzzi, 'Il Ruwenzori, Relazione Scientifiche,' I, p. 288, fig. 4.

Medje, January 22, 1910; one male. (Lang and Chapin.)

This specimen fully agrees with Borelli's description and clearly represents his species. Our individual is somewhat smaller in body length, 8.5 mm., but this difference is probably due to variation in the amount of abdominal extension, as the forceps length is identical, 2.9 mm. We are figuring the apex of the male abdomen (Fig. 37) on a larger scale and with more detail than in the sketch given by Borelli in 'Il Ruwenzori.'

The species is known only from the original locality, Ibanda, which is at an elevation of 4540 feet in the Mobuku Valley, on the north-eastern slope of Ruwenzori, and Medje. Ibanda is in open country, so it is possible that at Medje the species is a forest invader from the Sudanese savannah region.

Diaperasticinæ

DIAPERASTICUS Burr

1907, Trans. Entom. Soc. London, p. 98.

Genotype.—*Sphingolabis sansibarica* Karsch. (By original designation.)

This genus is the sole component of the subfamily, and it is most remarkable in having the head sexually dimorphic. The males have the lateral portions of the occiput inflated and elevated above the level of the face and interocular region; a median extension of the latter extends to the caudal occipital margin and separates the inflated sections, which are generally sharply defined. The male forceps in the genotypic species show considerable variation, developing brachylabic and macrolabic extremes, although no such decided variation is indicated in the widely distributed *D. erythrocephalus*. The broadly transverse and rectangulate male pygidium is a feature which aids readily in recognizing this genus.

The species are all African, and of them one, *bonchampsi*, may prove to be a variant of *erythrocephalus*, which possibility we have discussed below under the former name.

Key to the Species of *Diaperasticus*

1. Occiput of male with lateral inflated portions separated caudad by more than one-third of width of occiput at caudal margin. Antennæ very slender, joints greatly elongate; fifth joint hardly shorter than the proximal joint. Forceps of male distinctly sigmoid, subcerviform; of female very slender, elongate, as long as abdomen, internal margins serrulate proximad. *sansibaricus* (Karsch).

   Occiput of male with lateral inflated portions separated caudad by less than one-fourth of width of occiput at caudal margin. Antennæ of more normal type, joints much less elongate, fifth joint distinctly shorter than the proximal joint. Forceps of male not distinctly sigmoid, branches moderately arcuate convergent; of female much shorter than the abdomen, more robust, internal margins serrulate for nearly entire length..........................2.

2. Head of male with lateral occipital areas evident but not sharply delimited. Forceps of male with proximal internal lamellations having margins minutely crenulate.....................................*bonchampsi* (Burr).

   Head of male with lateral occipital areas decidedly and very sharply delimited. Forceps of male with proximal internal lamellations having margin coarsely and distinctly crenulate. (Forceps of female tricolored.) *erythrocephalus* (Olivier).

Diaperasticus sansibaricus (Karsch)

Sphingolabis sansibarica Karsch, 1886, Berlin. Entom. Zeitschr., XXX, p. 90, Pl. iii, fig. 8. ♂. Zanzibar.

Apterygida mackinderi Burr, 1900, Ann. Mag. Nat. Hist., (7) VI, p. 83, Pl. iv, figs. 3 and 3*a*. ♂. Nairobi, 5500 feet, British East Africa (Kenya Colony); Kikuyu Country, British East Africa (Kenya Colony).

This synonymy was established some years ago by Burr, and appears to us to be correct.

Niangara, November, 1910; one male (Lang and Chapin.)

This specimen has the forceps much as figured by Borelli,[1] but their length is slightly greater in the Niangara specimen, although the body length is less. Our individual measures 11 mm. in length of body, 6 mm. in length of forceps. The wings are well developed; the mediocaudal impressed portion of the occiput is over twice as wide proportionately as in *D. erythrocephalus*, as has been well figured by Burr.[2]

This species is one of the Savannah Subprovince, ranging from Niangara to Zanzibar, south to the northern Transvaal (Zoutpansberg) and the coast of Natal (Port Natal). It has been recorded from within the Forest Province but once, then from the Moëra Forest, near Beni, Semliki Valley. The only previous Belgian Congo record is the last mentioned one.

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[1] 1909, 'Il Ruwenzori, Relazione Scientifiche,' I, p. 290, fig. 5.

[2] 'Genera Insectorum, Dermaptera,' Pl. ix, fig. 11. (Compare with Pl. vii, fig. 11*a*.)

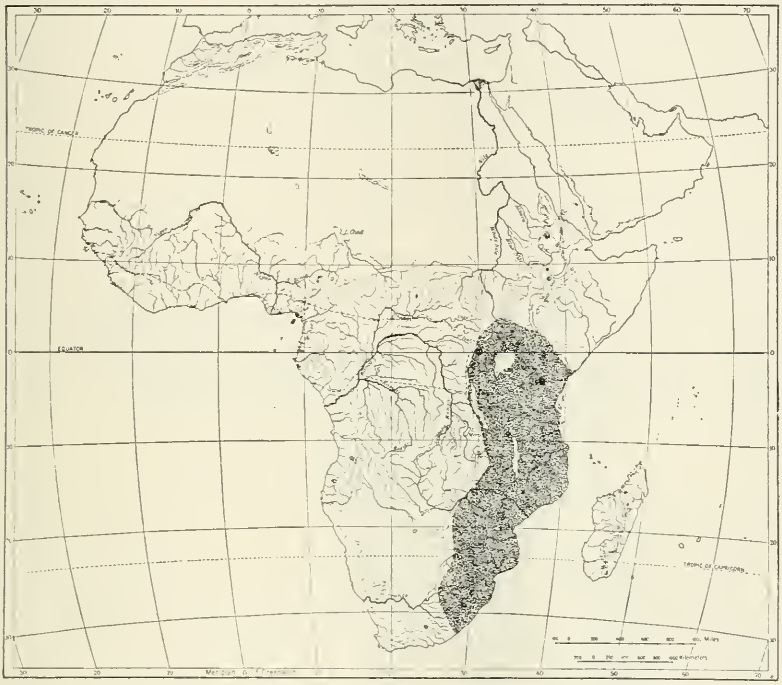

Fig. 39. Area of known distribution of *Diaperasticus sansibaricus.*

Diaperasticus bonchampsi (Burr)

Apterygida bonchampsi Burr, 1904, Trans. Entom. Soc. London, p. 317. ♂, ♀. Abyssinia.

Elisabethville; one male. (J. M. Springer.) [Hebard Collection.]

The present specimen shows certain differences which distinguish it from a quite extensive series of the widely distributed *D. erythrocephalus,* and which apparently associate it with Burr's species. The author of the species has recently stated that *bonchampsi* is, in his opinion, a variant of *erythrocephalus.*[1] This may prove to be the case, but the present specimen agrees quite well with his description of *bonchampsi,* and also shows several features of difference from a large series of the older species.

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[1] 1916, Journ. Royal Microsc. Soc., p. 18.

These features are: the head has the lateral inflated portions of the occiput poorly defined, in no way as clearly and sharply marked as in *erythrocephalus*, although their form is essentially the same as in the latter; inter-ocular region apparently more inflated and less deplanate than in *erythrocephalus;* forceps of the males with the proximal internal lamellate tooth having its margins minutely crenulate, instead of coarsely and distinctly crenulate as in *erythrocephalus*. These features may prove to be of little importance, particularly those of the forceps, but the head characters in this genus, as far as our present knowledge goes, are quite fixed.

The Elisabethville specimen has the tegmina without a dark sutural line. The wings are well developed and uniformly pale yellowish, similar to the tegmina.

This species is one of the Savannah Province, and has been taken only on the eastern border of the Sudanese Subprovince. The records extend from Abyssinia and the Nile between Khartum and Gondokoro, south to Nyasaland and Katanga (Elisabethville), east to the Ukambi Mountains, "German" East Africa (Tanganyika Territory).

Diaperasticus erythrocephalus (Olivier)[1]

Forficula erythrocephala Olivier, 1791, 'Encycl. Méthod. Ins.,' VI, p. 468. ♀. Cape of Good Hope.

Forficula jackeryensis Palisot de Beauvois, 1805, 'Ins. Rec. Afriq. Amér.,' p. 36, Orth. Pl. i, fig. 4. ♀. Buonopozo, Oware (Wari, southern Nigeria).

Forficula serrata Serville, 1839, 'Hist. Nat. Ins., Orth.,' p. 40. ♂. Senegal.

F[orficula] natalensis Stål, 1855, Öfv. Kongl. Vetensk. Akad. Förhandl., XII, p. 348. ♂. Port Natal (Durban), Natal.

F[orficula] africana Dohrn, 1865, Stettin. Entom. Zeitung, XXVI, p. 86. ♂, ♀. Senegal; Cape (of Good Hope); Port Natal (Durban), Natal.

Forficula variana Scudder, 1876, Proc. Boston Soc. Nat. Hist., XVIII, p. 253. ♀. Liberia.

Chelis [oches] pulchella Gerstæcker, 1883, Mitth. Naturw. Ver. Neu-Vorpomm. und Rügen, Greifswald, XIV, p. 42. ♂, ♀. Abó, Cameroon; Lambarené, Ogowe, French Congo.

Apterygida cagnii Borelli, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 541, p. 3. ♂. Ibanda, Ruwenzori district, Uganda.

[*Apterygida erythrocephala*] var. *aptera* Borelli, 1907, Ann. Mus. Civ. Stor. Nat. Genova, XLIII, p. 386. ♂, ♀. Musola and Basilé, Fernando Po; Lambarené (Limbareni), French Congo.

[*Diaperasticus erythrocephalus*] var. *maculipes* Borelli, 1914, Boll. Lab. Zool. Gen. Agrar. Portici, VIII, p. 274. ♂. Mamou, French Guinea.

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[1] Borelli (1909, in 'Il Ruwenzori, Relazione Scientifiche,' I, p. 292), gives a "Var. *dietzi* Borm.," of this species, the reference to and description of which we have been unable to locate. It is stated by Borelli to differ chiefly in the absence of the wings, and probably represents the same condition as that described by him, in 1907, as variety *aptera*.

The synonymy given above has already in large part been established in print, while that of *cagnii* also has been suggested. There is no question in my mind as to the correctness of the reference of Palisot's *jackeryensis* to this species, the description and the figure, as well as the additional comments made by Serville[1] from Palisot's type, being conclusive. The naming of a melanistic phase such as *cagnii*, an abbreviate winged type like *aptera*, and an unusually marked phase such as *maculipes* do not, to my mind, help the future of entomological science. The mere feature of fully developed wings or abbreviate wings is such an evident condition of dimorphism in many genera of Dermaptera, as also in many members of the orthopterous family Gryllidæ, and to a lesser extent in the Blattidæ, that it seems to us to be crowding the literature to provide them with names. The author's policy has been not to give names to these phases, as to consistently do so would mean the bestowal of thou-

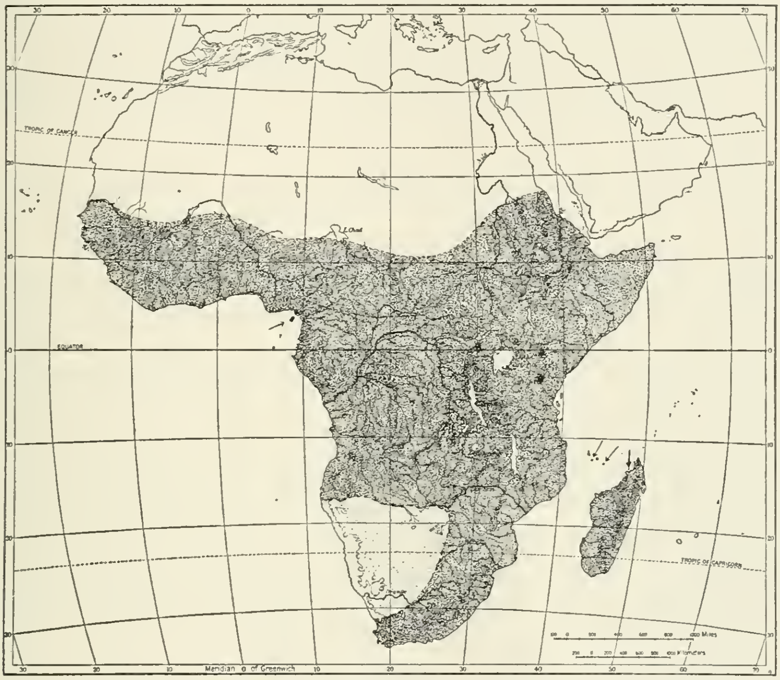

Fig. 40. Area of known distribution of *Diaperasticus erythrocephalus* indicated by heavy stipple, of possible but unproven distribution by light stipple.

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[1] 1839, 'Hist. Nat. Ins., Orth.,' p. 42.

sands of similar names on other forms where equal dimorphism is known to occur, and where such dimorphism is often complicated by dichromatism and also the development of consistently uniform geographic races, based upon structural features. To recognize all of these tendencies by name would require polynomials, and we prefer to withhold names from cases of pure dimorphism and dichromatism, which we know are expressions of similar underlying tendencies in a number of groups.

Yakuluku, November, 1911; one male, one female. Faradje, January, 1913; thirty-six males, thirty females. Medje, January 22, 1910; two males, two females. Risimu, September 7 to 8, 1909; one male. Stanleyville, February to April, 1915; five males, ten females. Zambi, June, 1915; one male. (All Lang and Chapin.)

This quite extensive series exhibits very well the great range of variation in size and wing development of this widely distributed species. Of the Faradje series, nine males and six females have the wing abbreviate and not evident distad of the tegmina, the remainder from that locality having well-developed and evident wings. The Stanleyville representation has one male and two females without evident wings, the remainder (four males, eight females) having them well developed. The other specimens, with the exception of the Zambi male, have fully developed wings.

In size the series shows a very great amount of variation, even in material from the same locality. Males from Faradje range from 7.7 to 10.5 mm. in length of body; from 2 to 2.6 mm. in length of forceps. The Zambi male and several of the same sex from Stanleyville have greater body length than the maximum given above, the former being 11 mm. in body length; a Medje male has forceps 4.5 mm. in length, this being approached by males from Stanleyville and Medje.

The male forceps show an appreciable amount of variation in the exact curve of the branches and also in the degree of robustness of the same. The general form of the forceps remains the same throughout the series. The internal margin of the branches is always distinctly and coarsely crenulato-denticulate on the deplanate basal lamellation, but the internal margin distad of the tooth varies in the number and disposition of the denticulations normally present upon it.

The shape and proportions of the inflated lateral portions of the occiput have been well illustrated by Burr.[1]

The present series contains no melanistic individuals such as those upon which the name *cagnii* was based. There is an appreciable amount of variation in the depth of the general color tones, but the normal pattern of the species is well marked in all except several teneral specimens. The strongly particolored pattern of the forceps, in both sexes, is uniformly indicated in the series.

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[1] 1911, 'Genera Insectorum, Dermaptera,' Pl. VII, fig. 11*a*.

This species is widely distributed over Africa south of the Sahara, the most northern records being from Senegal; Mamou, French Guinea; Kete, Togo; Ibadan, Lagos; Buonopozo, southern Nigeria; Faradje, north-eastern Belgian Congo, and Massaua, Eritrea. From these localities the species ranges southward to the Cape of Good Hope, occurring also in Madagascar, Nossi Bé, in the Comoros (Moheli) and on the eastern African coastal island of Pemba. The previous records of the species from the Belgian Congo were from Avakubi and Luebo.

A SYNONYMIC CATALOGUE OF THE DERMAPTERA OF THE BELGIAN CONGO

The following catalogue brings together the original references and those of the synonyms of the species of Dermaptera known from the Belgian Congo at the present time, together with a summary of the African distribution of the species and the type localities of the same. In addition to those forms which have been definitely recorded from the Belgian Congo, we are including a number of species which have been reported from localities in Uganda and East Africa within extremely short distances of the Belgian Congo, and which will in all probability be found in the area under consideration. The recent adjustment of boundary lines has thrown within the Belgian Congo many of the localities which were considered to be neighboring but outside of the Belgian Congo when the manuscript of this catalogue was prepared. No effort has been made to determine the exact position of the division of old German East Africa, and that area as a whole is referred to as "German" East Africa (Tanganyika Territory).[1]

Definitely recorded from the Belgian Congo we have twenty genera and thirty-eight species, while from immediately adjacent sections of the surrounding regions we have four other genera and eighteen additional species. In addition to the species here included a very considerable number of species have been described or recorded from the Cameroon, and of these we feel certain a large portion will, in the future, be found within the Belgian Congo.

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[1] The following localities listed under "German" East Africa are in Ruanda, which is at present (1924) under Belgian mandate: Rugege, Ufumbiro Volcanoes, Kisenje, and Sabinyo.

HEMIMERINA

Hemimeridæ

HEMIMERUS Walker

1871, 'Catal. Dermapt. Salt. Brit. Mus.,' V, Suppl., p. 2

Hemimerus hanseni SHARP, 1895, 'Cambridge Nat. History,' V, p. 217, Figs. 114–116.

Gold Coast, Cameroon, Belgian Congo (Ituri, Uele), Uganda, "German" East Africa (Tanganyika Territory), ? Portuguese East Africa. TYPE LOCALITY: Kitta, Gold Coast.

PROTODERMAPTERA

Pygidicranidæ

Diplatyinæ

DIPLATYS Serville

1831, Ann. Sci. Nat., XXII, p. 33

GENOTYPE: *Diplatys macrocephalus* (Palisot de Beauvois).

Cylindrogaster STÅL, 1855, Öfv. Kongl. Vetensk.-Akad. Förhandl., XII, p. 350. [Type by monotypy, *C. gracilis* Stål.]

Nannopygia DOHRN, 1863, Stettin. Entom. Zeitung, XXIV, p. 60. [Type by monotypy, *N. gerstæckeri* Dohrn.]

Dyscritina WESTWOOD, 1881, Trans. Entom. Soc. London, p. 603. [Type by monotypy, *D. longisctosa* Westwood.]

Verhœffiella ZACHER, 1910, Entom. Rundsch., XXVII, p. 105. [Type by designation, *Diplatys æthiops* Burr.]

Paradiplatys ZACHER, 1910, idem, p. 105. [Type by designation, *Diplatys conradti* Burr.]

Diplatys macrocephalus (PALISOT DE BEAUVOIS).

Forficula macrocephala PALISOT DE BEAUVOIS, 1805, 'Ins. Rec. Afriq. Amér.,' p. 36, Orth. Pl. I, fig. 5, (♂).

Diplatys macrocephala BURR, 1900, Ann. Soc. Entom. Belgique, XLIV, p. 47; 1904, Trans. Entom. Soc. London, p. 282.

Diplatys macrocephalus BURR, 1911, Trans. Entom. Soc. London, p. 29.

Southern Nigeria, Fernando Po, Belgian Congo (Boma and Stanley Pool), Uganda. TYPE LOCALITY: "Benin."

Diplatys quæsitus REHN. See page 355.

Belgian Congo. TYPE LOCALITY: Faradje.

Diplatys raffrayi DUBRONY (Bormans), 1879, Actas Soc. Españ. Hist. Nat., VIII, p. 91, (♂). BORELLI, 1915, 'Résultats Scientif., Voy. Alluaud et Jeannel en Afriq. Orient.,' Orth., I, p. 5, Pl. I, fig. 1, (♂).

Portuguese Guinea, Uganda (Katende, 1500–2000 meters elev.), British East Africa (Kenya Colony), East Africa. TYPE LOCALITY: "Zanzibar."

Karschiellinæ

KARSCHIELLA Verhoeff

1902, Zoolog. Anzeiger, XXV, p. 183

GENOTYPE: *Karschiella büttneri* (Karsch). (By selection of Kirby, 1904.)

Karschiella büttneri (Karsch).

Pygidicrana büttneri KARSCH, 1886, Berlin. Entom. Zeitschr., XXX, 1886, p. 86, Pl. III, fig. 4, (♂).

Belgian Congo. TYPE LOCALITY: "Kuako to Kimpoko."

Karschiella camerunensis VERHOEFF, 1902, Zoolog. Anzeiger, XXV, p. 183, (♂).

Bormansia lictor BURR, 1907, Deutsche Entom. Zeitschr., p. 487, (♂).

Bormansia meridionalis REHN (not of Burr, 1904), 1905, Proc. U. S. Nat. Mus., XXIX, p. 504.

Karschiella camerunensis BURR, 1910, Proc. U. S. Nat. Mus., XXXVIII, p. 444.

Cameroon, Belgian Congo (Luebo).[1] TYPE LOCALITY: "Cameroon."

Karschiella neavei BURR, 1909, Ann. Soc. Entom. Belgique, LIII, p. 96 (♂, ♀).[2]

Belgian Congo (Katanga). TYPE LOCALITY: "Katanga."

BORMANSIA Verhoeff

1902, Zoolog. Anzeiger, XXV, p. 184

GENOTYPE: *Bormansia africana* Verhoeff.

Bormansia africana VERHOEFF, 1902, Zoolog. Anzeiger, XXV, p. 184, (♂). BORELLI, 1915, 'Résultats Scientif., Voy. Alluaud et Jeannel en Afriq. Orient.,' Orth., I, p. 5, Pl. I, figs. 2 and 3, (♂, ♀).

Belgian Congo (Medje and Garamba), Uganda, "German" East Africa (Tanganyika Territory). TYPE LOCALITY: "German" East Africa (Tanganyika Territory).

Bormansia impressicollis VERHOEFF, 1902, Zoolog. Anzeiger, XXV, p. 184, (♀). BORELLI, 1915, 'Résultats Scientif., Voy. Alluaud et Jeannel en Afriq. Orient.,' Orth., I, p. 5, Pl. I, fig. 4, (♀).

Uganda (Butiti), British East Africa (Kenya Colony), "German" East Africa (Tanganyika Territory). TYPE LOCALITY: Taita, "German" East Africa (Tanganyika Territory).

Pygidicraninæ

DICRANA Burr

1908, Ann. Mag. Nat. Hist., (8) II, pp. 384, 387

GENOTYPE: *Dicrana frontalis* (Kirby). (Type by indication.)

Dicrana caffra (DOHRN).

Pygidicrana caffra DOHRN, 1867, Stettin. Entom. Zeitung, XXVIII, p. 343, (♀).

Cameroon, Uganda (Fort Portal and Kitagueta), Somaliland, East Africa, South Africa. TYPE LOCALITY: "Caffraria."

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[1] Recorded by Rehn (1905, Proc. U. S. Nat. Mus., XXIX, p. 504) as *Bormansia meridionalis*, as later shown by Burr (1910, idem, XXXVIII, p. 444).

[2] According to Burr (1914, Ann. Mag. Nat. Hist., (8) XIII, p. 378; 1915, Journ. Royal Microsc. Soc., p. 429) Zacher's *Karschiella bidentata* (1911, Zool. Jahrb. Abt. Syst., XXX, pp. 349, 350, fig. Z) from Cameroon may equal *nearei*.

Dicrana biaffra (BORMANS).

Pygidicrana biaffra BORMANS, 1903, in Burr, Ann. Mag. Nat. Hist., (7) XI, p. 232, (♂).

Kalocrania biafra BURR, 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 338.

Cameroon, Belgian Congo (Ukaika-Mawambi). TYPE LOCALITY: "Cameroon."

Dicrana separata BURR, 1908, Ann. Mag. Nat. Hist., (8) II, p. 387, (♂); 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 338; 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 455.

Belgian Congo (Ruzizi Valley, Rutshuru Valley and North-west Tanganyika), "German" East Africa (Tanganyika Territory), South-west Africa. TYPE LOCALITY: "Nguru."

Dicrana livida (BORELLI).

Pygidicrana livida BORELLI, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 558, p. 1, (♀).

Uganda (Ibanda), "German" East Africa (Tanganyika Territory). TYPE LOCALITY: Ibanda, Uganda.

Dicrana wigginsi BURR, 1914, Ann. Mag. Nat. Hist., (8) XIV, p. 422, (♂, ♀).

Uganda. TYPE LOCALITY: Entebbe, Uganda.

Echinosomatinæ

ECHINOSOMA Serville

1839, 'Hist. Nat. Ins., Orth.,' p. 34

GENOTYPE: *Echinosoma afrum* (Palisot de Beauvois).

Echinosoma afrum (PALISOT DE BEAUVOIS) BURR, 1909, Bull. Soc. Entom. Italiana, LX, p. 175; 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 338.

Forficula afrum PALISOT DE BEAUVOIS, 1805, 'Ins. Rec. Afriq. Amér.,' p. 53, Orth. Pl. I, fig. 1, (♀).

Echinosoma fuscum BORELLI, 1907, Ann. Mus. Civ. Stor. Nat. Genova, XLIII, p. 350, (♂). BURR, 1915, Journ. Royal Micros. Soc., 1915, p. 438.

Echinosoma afri RODZIANKO, 1897, Wiener Entom. Zeit., XVI, p. 154.

Portuguese Guinea, Ivory Coast, Gold Coast, Togo, Nigeria, Cameroon, Fernando Po, Spanish Guinea, French Congo, Belgian Congo (Stanley Pool, Kuako, Medje, Ukiaka-Mawambi, and Barobiti[1]), Uganda. TYPE LOCALITY: "Kingdom of Oware and Benin," Nigeria.

Echinosoma wahlbergi DOHRN, 1863, Stettin. Entom. Zeitung, XXIV, p. 64, (♂). BURR, 1900, Ann. Soc. Entom. Belgique, XLIV, p. 48; 1908, idem, LIII, p. 35; 1909, Bull. Soc. Entom. Italiana, LX, p. 175.

Portuguese Guinea, Liberia, Togo, Cameroon, Fernando Po, French Congo, Belgian Congo (Popokabaka, Buta [Rubi], and Lingunda), Gallaland, British East Africa, "German" East Africa (Tanganyika Territory), Delagoa Bay, Zululand, Natal, Transvaal, Cape Colony. TYPE LOCALITY: "Caffraria."

Echinosoma occidentale BORMANS, 1893, in Bolivar, Ann. Soc. Entom. France, LXII, p. 170, (♂). BURR, 1911, Stettin. Entom. Zeitung, LXXII, p. 331; 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 338.

Ivory Coast, Togo, Cameroon, French Congo, Belgian Congo (Medje and Ukaika-Mawambi), Uganda. TYPE LOCALITY: Assinie, Ivory Coast.

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[1] This locality, given on the authority of Burr, we are unable to place. Possibly the spelling is erroneous.

Labiduridæ

Psalinæ

ANISOLABIS Fieber

1853, Lotos, III, p. 257

GENOTYPE: *Anisolabis maritima* (Géné).

Anisolabis pagana BURR, 1915, Journ. Royal Microsc. Soc., p. 535, fig. 61, Pl. x, fig. 8, (♂).[1]

Cameroon, Belgian Congo (Stanleyville). TYPE LOCALITY: "Cameroon."

APOLABIS Burr

1915, Journ. Royal Microsc. Soc., pp. 536, 558

GENOTYPE: *Apolabis hottentotta* (Dohrn). (Type by indication.)

Apolabis picea (BORELLI).

Gonolabis picea BORELLI, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 572, p. 1, (♂, ♀).

Uganda. TYPE LOCALITY: Butiti, Uganda.

EUBORELLIA Burr

GENOTYPE: *Euborellia mœsta* (Géné).

Borellia BURR, 1909, Deutsch. Entom. Zeitschr., p. 325.

Euborellia BURR, 1910, Proc. U. S. Nat. Mus., XXXVIII, p. 448, footnote.

Euborellia cincticollis (GERSTÆCKER).

Brach[*ylabis*] *cincticollis* GERSTÆCKER, 1883, Mitth. Naturwiss. Ver. Neu-Vorpomm. und Rügen, Greifswald, XIV, p. 44, (♂, ♀).

Psalis (?) *picina* KIRBY, 1891, Journ. Linn. Soc. London, Zoöl., XXIII, p. 516, (♂, ♀).

Psalis cincticollis BURR, 1909, Ann. and Mag. Nat. Hist., (8) IV, p. 115; 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 456; 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 338.

Psalis picina KIRBY, 1904, 'Synon. Catal. Orth.,' I, p. 14.

Gambia, Liberia, Cameroon, French Congo, Belgian Congo (Stanley Pool, Risimu, Medje, Niapu, Mawambi and Moëra Forest), Uganda and Victoria Nyanza. TYPE LOCALITY: Bonjongo, Cameroon.

Euborellia compressa (BORELLI).

Anisolabis compressa BORELLI, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 558, p. 3, (♂, ♀).

Uganda. TYPE LOCALITY: Bimbia, Uganda.

Euborellia debilis (BURR).

Psalis debilis BURR, 1907, Berlin. Entom. Zeitschr., LII, p. 202, (♂, ♀); 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 456; 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 338.

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[1] Burr has described *Anisolabis quærens* (1915, Journ. Royal Microsc. Soc., p. 530, fig. 60, (♂)) from "Mundane, Congo," which is in every probability a typographical or pen error for Mundame, Cameroon, a well-known locality.

Belgian Congo (Avakubi, Ukaika-Mawambi and North-west Tanganyika), Uganda and "German" East Africa (Tanganyika Territory). Type Locality: Ngomeni, "German" East Africa (Tanganyika Territory).

Euborellia annulipes (Lucas).

Forficesila annulipes Lucas, 1847, Ann. Soc. Entom. France, (2) V, Bull., p. lxxxiv (sex not indicated). (The synonymy, which is based wholly on extra continental African records, is omitted.)

Anisolabis annulipes Burr, 1900, Ann. Soc. Entom. Belgique, XLIV, p. 48.

Widely distributed within the tropics and subtropics of both the Old and New Worlds. In Africa: Azores, Madeira Islands, Canary Islands, Cape Verde Islands, Morocco, Algeria, Tunis, Egypt, Eritrea, Gallaland, British East Africa (Kenya Colony), Kilimanjaro, Pemba Island, Victoria Nyanza, Uganda, Cameroon, Belgian Congo (Popokabaka), Cape of Good Hope, Comoro Islands and Madagascar. Type Locality: "Jardin des Plantes, Paris" (introduced).

Labidurinæ

Labidura Leach

1815, 'Edinburgh Encycl.,' IX, p. 118

Genotype: *Labidura riparia* (Pallas).

Labidura riparia (Pallas).

Forficula riparia Pallas, 1773, 'Reise Russischen Reichs,' II, Buch 2, Anhang, p. 727, (♂).

Labidura riparia Bolivar, 1892, Bull. Soc. Zool. France, XVII, p. 47. Burr, 1900, Ann. Soc. Entom. Belgique, XLIV, p. 49. Rehn, 1905, Proc. U. S. Nat. Mus., XXIX, p. 502. Burr, 1908, Bull. Mus. Hist. Nat. Paris, (1907), p. 511; 1908, Ann. Soc. Entom. Belgique, LII, p. 35; 1909, Boll. Soc. Entom. Italiana, LX, p. 175; 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 456; 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 338.

Labidura crenata Burr, 1908, Bull. Mus. Hist. Nat. Paris, (1907), p. 511.

(The synonyms based upon African material are given in full on page 372.)

Tropical and subtropical regions of most of the world. In Africa: Morocco, Algeria, Tunis, Egypt, Canary Islands, Cape Verde Islands, Senegal, Portuguese Guinea, Ivory Coast, Niger River, Nigeria, Cameroon, French Congo, Belgian Congo (Stanley Pool, Luebo, Hiri (error for Itiri or Semliki River), Kindu Forest, Garamba, Faradje, Niangara, Niapu, Medje, Batama, Stanleyville, Malela, Mawambi, Ukaika-Mawambi, Beni, North-west Tanganyika and Lusambo), Uganda, Gallaland, Abyssinia, Somaliland, French Somaliland, Eritrea, Rhodesia, Transvaal, Orange River Colony, Zululand, Natal, Cape Colony, Comoro Islands, Madagascar, Mauritius and Sokotra. Type Locality: "Shores of the Irtysch River," western Siberia.

Forcipula Bolivar

1897, Ann. Soc. Entom. France, LXVI, p. 283

Genotype: *Forcipula quadrispinosa* (Dohrn). (Type by monotypy.)

Forcipula congo Burr, 1900, Ann. Soc. Entom. Belgique, XLIV, p. 49.

Belgian Congo (Bena-Bendi). Type Locality: "Bena Bendi, Sankourou."

Forcipula gariazzi Borelli, 1900, Boll. Mus. Zool. Anat. Comp. Torino, XV, No. 381, p. 1, fig. (♂); Burr, 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 79.

Gold Coast, Cameroon, French Chad Region, Belgian Congo (Stanley Pool and Madimba). Type Locality: Madimba, Belgian Congo.

Brachylabinæ

ISOLABIS Verhoeff

1902, Sitzungsb. Gesell. Naturf. Freunde Berlin, pp. 11, 14

Genotype: *Isolabis braueri* Verhoeff. (Type by monotypy.)

Isolabis braueri Verhoeff, 1902, Sitzungsb. Gesell. Naturf. Freunde Berlin, p. 14, (♂).

Belgian Congo (Kimpoko). Type Locality: "Kuako to Kimpoko."

Apachyidæ

APACHYUS Serville

1831, Ann. Sci. Nat., XXII, p. 35

Genotype: *Apachyus depressus* (Palisot de Beauvois).

Apachyus depressus (Palisot de Beauvois).

Forficula depressa Palisot de Beauvois, 1805, 'Ins. Rec. Afriq. Amér.,' p. 36, Orth. Pl. i, fig. 5, (♂).

Apachyus reichardi Karsch, 1886, Berlin. Entom. Zeitschr., XXX, p. 85, Pl. iii, fig. 3, (♂). Burr, 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 339.

Portuguese Guinea, Liberia, Ivory Coast, Gold Coast, Southern Nigeria, Cameroon, Fernando Po, Spanish Guinea, French Congo, Belgian Congo (Niangara, Akenge, Stanleyville, Medje and Ukaika-Mawambi), Benguela, Tanganyika, western "German" East Africa (Tanganyika Territory), Portuguese East Africa, Transvaal. Type Locality: "Oware," Nigeria.

Apachyus murrayi Dohrn, 1863, Stettin. Entom. Zeitung, XXIV, p. 44, (Sex?). Bormans and Krauss, 1900, 'Das Tierreich,' Lief. 11, p. 14. Burr, 1908, Ann. Soc. Entom. Belgique, LII, p. 34; 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 457.

Southern Nigeria, French Congo, Belgian Congo (Luki, Stanley Pool, Stanleyville, Avakubi, Medje, Ukaika-Mawambi, and Kwidjwi Island in Lake Kivu). Type Locality: "Old Calabar."

Superfamily EUDERMAPTERA

Labiidæ

Vandicinæ

VANDEX Burr

1911, Deutsche Entom. Nat. Bibl., II, p. 59

Genotype: *Spongiphora schubotzi* Burr. (Type by designation.)

Vandex schubotzi (Burr).

Spongiphora schubotzi Burr, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 121, (♂, ♀).

"German" East Africa (Ruanda). Type Locality: Rugege Forest, 6000 feet.

Spongiphorinæ

SPONGOVOSTOX Burr

1911, Deutsche Entom. Nat. Bibl., II, p. 59

GENOTYPE: *Spongovostox quadrimaculatus* (Stål). (Type by designation.)

Spongovostox quadrimaculatus (STÅL).

Forficula 4-maculata STÅL, 1855, Öfv. Kongl. Vetensk.-Akad. Förhandl., XII, p. 348.

Forficula protensa GERSTÆCKER, 1883, Mitth. Naturwiss. Ver. Neu-Vorpomm. und Rügen, Greifswald, XIV, p. 45, (♂, ♀).

Ivory Coast, Gold Coast, Cameroon, Fernando Po, Spanish Guinea, French Congo, Uganda (Entebbe), Kilimanjaro, Zululand, Natal, Cape Colony. TYPE LOCALITY: "Port Natal."

Spongovostox assiniensis (BORMANS).

Spongiphora assiniensis BORMANS, 1893, in Bolivar, Ann. Soc. Entom. France, XLII, p. 170, (♀).

Spongiphora ochracea BORG, 1904, Arkiv för Zoologi, I, p. 569, Pl. XXVI, fig. 6, (♂, ♀).

Spongiphora robur BURR, 1906, Mem. Soc. Españ. Hist. Nat., I, p. 293, (♂).

Ivory Coast, Gold Coast, Cameroon, Fernando Po, Spanish Guinea, French Congo, Uganda, Victoria Nyanza and "German" East Africa (Tanganyika Territory). TYPE LOCALITY: "Assinie," Ivory Coast.

Spongovostox gestroi (BURR).

Apterygida feæ BORELLI, 1907, Ann. Mus. Civ. Stor. Nat. Genova, XLIII, p. 387, (♂, ♀). (Not *Spongovostox feæ* (Dubrony), 1879.)

?*Spongiphora tripunctata* BURR, 1909, Bull. Soc. Ent. Italiana, LX, p. 179.

Spongiphora gestroi BURR, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 122, (♂, ♀).

Portuguese Guinea, French Guinea, Belgian Congo (Ibembo). TYPE LOCALITY: Ibembo ("Ibambo"), Belgian Congo.

Spongovostox tripunctata (BORELLI).

Spongiphora tripunctata BORELLI, 1907, Ann. Mus. Civ. Stor. Nat. Genova, XLIII, p. 367, (♂).

Labia tripunctata BURR, 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped.,' III, Lief. 14, p. 458.

Cameroon, French Congo, Belgian Congo (Ibembo) and Lake Kivu. TYPE LOCALITY: "Fernand-Vaz," French Congo.

Spongovostox aloysii-sabaudiæ (BORELLI).

Spongiphora aloysii-sabaudiæ BORELLI, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 541, p. 1, (♂, ♀).

Ruwenzori district, Uganda. TYPE LOCALITY: "Ibanda."

Labiinæ

CHÆTOSPANIA Karsch

1886, Berlin. Entom. Zeitschr., XXX, p. 87

GENOTYPE: *Chætospania inornata* Karsch. (By monotypy.)

Sparattina VERHOEFF, 1902, Zoologischer Anzeiger, XXV, p. 198. (Based on *Sparattina flavicollis* Verhoeff.)

Chætospania pæderina (Gerstæcker).

Forficula pæderina Gerstæcker, 1883, Mitth. Naturw. Ver. Neu-Vorpomm. und Rügen, Greifswald, XIV, p. 46, (♀).

Sparatta bongiana Borg, 1904, Arkiv för Zoologi, I, p. 573, Pl. xxvi, figs. 3, 3*b*, (♂).

Chætospania escaleræ Burr, 1906, Mem. Soc. Españ. Hist. Nat., I, p. 295, (♂, ♀).

Gold Coast, Togo, Cameroon, Fernando Po, French Congo, Spanish Guinea and Uganda (Ibanda). Type Locality: "Aburi, Gold Coast."

Chætospania rodens Burr, 1907, 'Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro,' III, 17, Orth., 1, p. 7, Pl. i, fig. 5, (♂, ♀); 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 339.

Belgian Congo (Ukaika-Mawambi), Kilimanjaro, "German" East Africa (Tanganyika Territory). Type Locality: "Kibonoto," Kilimanjaro.

Chætospania ugandana Borelli, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 558, p. 4, (♂, ♀).

Cameroon, Uganda. Type Locality: "Ibanda," Uganda.

LABIA Leach

1815, 'Edinburgh Encycl.,' IX, p. 118

Genotype: *Labia minor* (Linnæus).

Labia minor (Linnæus) Burr, 1900, Ann. Soc. Ent. Belgique, XLIV, p. 50; 1908, idem, LII, p. 35.

Forficula minor Linnæus, 1758, 'Syst. Nat.,' 10th Ed., p. 423.

Labia minuta Scudder, 1862, Boston Journ. Nat. Hist., VII, p. 415, (♂, ♀).

Cosmopolitan. Records in Africa from: Morocco, Algeria, Egypt, Madeira Islands, Canary Islands, Togo, Cameroon, Spanish Guinea, Belgian Congo (Kinshasa), Uganda, Victoria Nyanza and Cape Colony. Type Locality: "Europe."

Labia borellii Burr, 1909, Bull. Soc. Entom. Italiana, XL, p. 178, (♂, ♀).

Victoria Nyanza. Type Locality: "Bugala, Sesse Archipelago, Victoria Nyanza."

Labia curvicauda (Motschulsky).

Forfiscelia curvicauda Motschulsky, 1868, Bull. Soc. Nat. Moscou, XXXVI, part 2, p. 2, (♂, ♀).

Synonymy based on African material is as follows:

Platylabia guineensis Dohrn, 1867, Stettin. Entom. Zeitung, XXVIII, p. 348, (♂, ♀).

Platylabia camerunensis Borg, 1904, Arkiv för Zoologi, I, p. 570, Pl. xxvi, figs. 4, 4*a* and 4*b*, (♂, ♀).

Platylabia bihastata Borg, 1904, idem, p. 572, Pl. xxvi, fig. 5, (♂).

Circumtropical. Records in Africa from: Madeira Islands, Portuguese Guinea, French Guinea, Southern Nigeria, Cameroon, Island of Principe, Island of Annobon, Uganda (Ibanda), "German" East Africa (Tanganyika Territory), Comoro Islands and Seychelles Islands. Type Locality: "Nura-Ellia Mts.," Ceylon.

Labia ochropus (Stål).

Forficula ochropus Stål, 1855, Öfv. Kongl. Vetensk.-Akad. Förhandl., XII, p. 348, (♂, ♀).

Labia marginalis Burr, 1908, Ann. Soc. Entom. Belgique, LII, p. 35; 1909, Bull. Soc. Entom. Italiana, LX, p. 179.

Ivory Coast, French Congo, Belgian Congo (Leopoldville, Buta (Rubi) and Bengamisa), Uganda, "German" East Africa (Tanganyika Territory), Portuguese East Africa, Zululand, Natal, Transvaal and Comoro Islands. Type Locality: "Port Natal" (Durban), Natal.

Labia owenii Burr, 1911, Ann. Mag. Nat. Hist., (8) VIII, p. 49, (♂, ♀); 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 339.

Liberia and Belgian Congo (Ukaika-Mawambi). Type Locality: Liberia.

Chelisochidæ

Chelisoches Scudder

1876, Proc. Boston Soc. Nat. Hist., XVIII, p. 295

Genotype: *Forficula morio* (Fabricius).

Lobophora Serville, 1839, 'Hist. Nat. Ins., Orth.,' p. 32. (Not of Curtis, 1825.)

Enkrates Burr, 1907, Trans. Entom. Soc. London, p. 131.

Chelisoches flavipennis (Fabricius).

Forficula flavipennis Fabricius, 1793, 'Entom. Syst.,' II, p. 5, (sex?).

Forficula plagiata Fairmaire, 1858, in Thomson, 'Archives Entom.,' II, p. 257, Pl. ix, fig. 3, (♀).

Senegal, Gold Coast, Cameroon, Fernando Po, French Congo and Belgian Congo (Stanleyville and Medje). Type Locality: "Senegal."

Forficulidæ

Anechurinæ

Pseudochelidura Verhoeff

1902, Zoolog. Anzeiger, XXV, pp. 187 and 196

Genotype: *Pseudochelidura sinuata* (Germar).

Pseudochelidura species, Burr, 1907, 'Wiss. Ergebn. Schwed. Zool. Exped. Kilimandjaro,' III, 17, Orth., I, p. 12, (♀).

Pseudochelidura species, Borelli, 1909, 'Il Ruwenzori, Relazione Scientifiche,' I, p. 289, (♀).

Ruwenzori district of Uganda, Kilimanjaro.

Forficulinæ

Apterygida Westwood

1840, 'Introd. Classif. Ins.,' Generic Synopsis, p. 44

Genotype: *Chelidura albipennis* Stephens.

Apterygida cavallii Borelli, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 541, p. 4, (♂, ♀). Burr, 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 458.

Uganda (Buhengo, Fort Portal and Ibanda) and western "German" East Africa (Volcanic region north-east of Lake Kivu, and Rugege Forest, south-west Ruanda). Type Locality: "Buhengo," Uganda.

FORFICULA Linnæus

1758, 'Syst. Nat.,' 10th Ed., p. 423

GENOTYPE: *Forficula auricularia* Linnæus.

Forficula brolemanni BORELLI, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 573, p. 1, (♂, ♀). BORELLI, 1915, 'Résultats Scientif., Voy. Alluaud et Jeannel en Afriq. Orient.,' Orth., I, p. 15, Pl. II, fig. 11 (♂).

Upper Senegal, Belgian Congo (Garamba, Faradje, Vankerckhovenville, Medje and Stanleyville), and Uganda. TYPE LOCALITY: "Bougounni," Upper Senegal.

Forficula senegalensis SERVILLE, 1839, 'Hist. Nat. Ins., Orth.,' p. 39, (♂, ♀).

Cape Verde Islands, Senegal, Togo, Eritrea, Kordofan, Senaar, Egyptian Sudan, Gallaland, Abyssinia, Belgian Congo (Medje), Uganda, British East Africa (Kenya Colony), "German" East Africa (Tanganyika Territory), Ovampoland, Southern Rhodesia, Transvaal, Zululand, Griqualand and Cape Colony. TYPE LOCALITY: "Senegal."

Forficula rodziankoi SEMENOFF, 1901, Revüe Russe d'Entom., I, p. 48. BURR, 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 459.

Abyssinia, Belgian Congo (Kasindi and western slope of Ruwenzori), British East Africa (Kenya Colony), "German" East Africa (Tanganyika Territory) and Tanganyika region. TYPE LOCALITY: "Harrar, Abyssinia."

Forficula sjöstedti BURR, 1907, Trans. Entom. Soc. London, p. 116, (♂, ♀); 1912, Sitzungsber. Gesell. Naturf. Freunde, Berlin, p. 327.

"German" East Africa (Tanganyika Territory) (Ufumbiro Volcanoes, Kisenje, Ruanda and Kilimanjaro region), British East Africa (Kenya Colony) (Kenya and Aberdare Mountains). TYPE LOCALITY: "Kiboscho," Kilimanjaro.

Neolobophorinæ

ARCHIDUX Burr

1909, Ann. Mag. Nat. Hist., (8) IV, p. 123

GENOTYPE: *Archidux adolfi* Burr. (By designation.)

Archidux adolfi BURR, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 124, (♂, ♀); 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 459; 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 339. BORELLI, 1915, 'Résultats Scientif., Voy. Alluaud et Jeannel en Afriq. Orient.,' Orth., I, p. 16, Pl. II, figs. 12–15 (♂, ♀).

Belgian Congo (North-western Tanganyika and western Tanganyika), "German" East Africa (Tanganyika Territory) (Ufumbiro Volcanoes), and British East Africa (Kenya Colony) (Kenya and Aberdare Mountains). TYPE LOCALITY: "Bamboo Forest, 3000 meters, Sabinyo," Ufumbiro Volcanoes.

Opisthocosmiinæ

OPISTHOCOSMIA Dohrn

1865, Stettin. Entom. Zeitung., XXVI, p. 76

GENOYTPE: *Opisthocosmia centurio* Dohrn.

Opisthocosmia pœcilocera (BORG) BURR, 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 339.

Ancistrogaster pœcilocera Borg, 1904, Arkiv för Zoologi, I, p. 577, Pl. xxvi, figs. 8 and 8*a*, (♀).

Opisthocosmia formosa Burr, 1905, Ann. Mag. Nat. Hist., (7) XVI, p. 492, (♂).

Portuguese Guinea, Cameroon, Belgian Congo (Medje, Ukaika-Mawambi and North-western Tanganyika) and "German" East Africa (Tanganyika Territory). Type Locality: "Cameroon."

Thalperus Burr

1911, 'Genera Insectorum, Dermaptera,' pp. 89, 92

Genotype: *Thalperus kuhlgatzi* (Burr).

Thalperus kuhlgatzi (Burr), 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 459.

Hypergus kuhlgatzi Burr, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 116, (♂, ♀).

Togo, Cameroon, and Belgian Congo (Faradje and Kirima, north-west coast of Lake Albert Edward). Type Locality: Bismarckburg, Togo.

Thalperus roccatii (Borelli).

Opisthocosmia roccatii Borelli, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 541, p. 2, (♂, ♀).

Belgian Congo (Medje) and Uganda (Ruwenzori district). Type Locality: Ibanda, Uganda.

Thalperus micheli (Burr), 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 339.

Opisthocosmia micheli Burr, 1904, Trans. Entom. Soc. London, p. 307, (♂, ♀).

Abyssinia, Belgian Congo (Moëra Forest near Fort Beni) and Southern Rhodesia. Type Locality: "Abyssinia."

Diaperasticinæ

Diaperasticus Burr

1907, Trans. Entom. Soc. London, p. 93

Genotype: *Diaperasticus sansibaricus* (Karsch).

Diaperasticus sansibaricus (Karsch).

Sphingolabis sansibarica Karsch, 1886, Berlin. Entom. Zeitschr., XXX, p. 90, Pl. iii, fig. 8, (♂).

Apterygida mackinderi Burr, 1900, Ann. Mag. Nat. Hist., (7) VI, p. 83, Pl. iv, figs. 3 and 3*a*, (♂); 1912, Ann. Naturhist. Hofmus. Wien, XXVI, p. 339.

Belgian Congo (Niangara and Moëra Forest near Fort Beni), Uganda (Ruwenzori district and Unyoro), British East Africa (Kenya Colony), "German" East Africa (Tanganyika Territory), Zanzibar, Natal and Transvaal. Type Locality: "Zanzibar."

Diaperasticus bonchampsi (Burr).

Apterygida bonchampsi Burr, 1904, Trans. Entom. Soc. London, p. 317, (♂, ♀).

Abyssinia, Egyptian Sudan, Belgian Congo (Elisabethville), British East Africa (Kenya Colony), "German" East Africa (Tanganyika Territory) and Nyassaland. Type Locality: "Abyssinia."

Diaperasticus erythrocephalus (Olivier).

Forficula erythrocephala Olivier, 1791, 'Encycl. Méthod., Ins.,' VI, p. 468, (♀).

Apterygida erythrocephala Burr, 1900, Ann. Soc. Entom. Belgique, XLIV, p. 52. Rehn, 1905, Proc. U. S. Nat. Mus., XXIX, p. 501.

Elaunon erythrocephala Burr, 1910, Proc. U. S. Nat. Mus., XXXVIII, p. 464; 1911, 'Wissensch. Ergebn. Deutschen Zentr.-Afr.-Exped., 1907–1908,' III, Lief. 14, p. 458.

(The synonymy is given in full on page 398.)

Senegal, Portuguese Guinea, French Guinea, Liberia, Slave Coast, Togo, Southern Nigeria, Cameroon, Fernando Po, French Congo, Belgian Congo (Luebo, Stanleyville, Risimu, Avakubi, Medje, Yakuluku and Faradje), Uganda, Victoria Nyanza, Eritrea, Somaliland, British East Africa (Kenya Colony), "German" East Africa (Tanganyika Territory), Zanzibar, Portuguese East Africa, Nyassaland, Angola, Transvaal, Natal, Cape Colony, Comoro Islands, Nossi-Bé and Madagascar. Type Locality: "Cape of Good Hope."

(67.5)

Article IV.—SIZE-VARIATION IN *PYRENESTES*, A GENUS OF WEAVER-FINCHES[1]

BY JAMES P. CHAPIN

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The extreme variation in size, especially of the beak, presented by the members of the genus *Pyrenestes* has long puzzled taxonomists. Similar differences may be seen in the genus *Oryzoborus* of tropical America, and in *Geospiza* of the Galápagos Islands. No explanation has been offered, I believe, for the conditions in *Oryzoborus;* but in *Geospiza*, while the nature of the food cannot be demonstrated to have influenced the remarkable diversity among their beaks,[2] insular segregation is assumed to have facilitated the evolution of the numerous forms. In the case of *Pyrenestes* such physical isolation is lacking, and we must look to other causes for an explanation.

Since returning from Africa I have enjoyed the privilege of studying all the *Pyrenestes* material in thirteen[3] other important museums of the United States and Europe, taking careful measurements and color-notes from approximately 200 skins, including all the known forms, and the type specimens of all but *P. sanguineus.* For the many courtesies received in the course of my studies, I beg to express my appreciation to the authorities of all these institutions.

TAXONOMIC REMARKS

After examining so great a part of the existing specimens, I have decided to recognize the following species and subspecies, the known distribution of which is shown in Fig. 1.

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[1] Scientific Results of the American Museum Congo Expedition. Ornithology, No. 10.

[2] Snodgrass, 1902, Auk, XIX, pp. 367–381.

[3] Cambridge (Mass.), Philadelphia, Pittsburgh, Washington, London, Tring, Paris, Brussels, Tervueren, Frankfort, Berlin, Munich, and Vienna.

Pyrenestes sanguineus sanguineus Swainson
Pyrenestes sanguineus coccineus Cassin
Pyrenestes ostrinus ostrinus (Vieillot)
Pyrenestes ostrinus maximus Chapin
Pyrenestes ostrinus centralis Neumann
Pyrenestes ostrinus rothschildi Neumann
Pyrenestes ostrinus gabunensis Neumann
Pyrenestes minor minor Shelley
Pyrenestes minor frommi Kothe

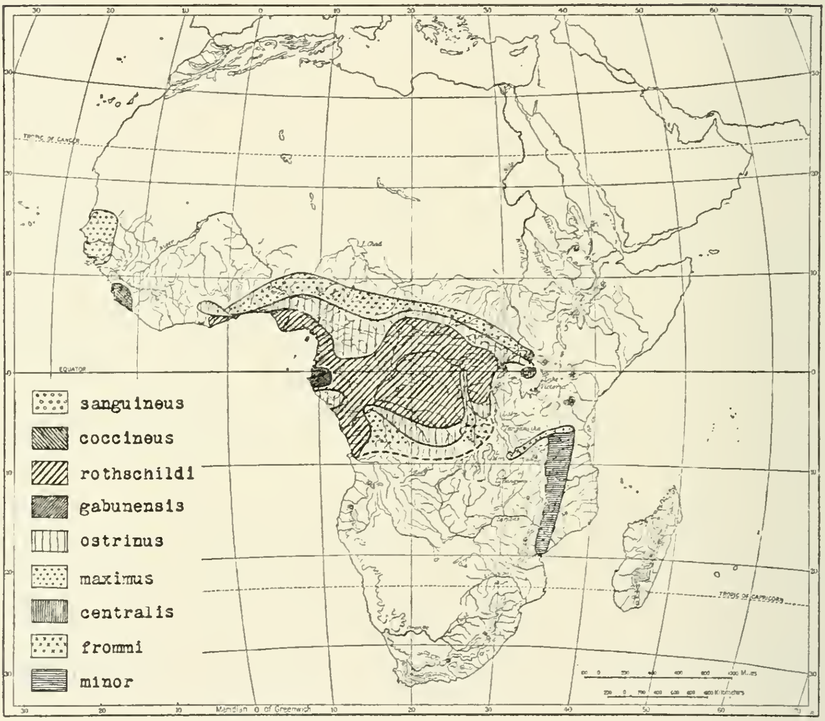
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
Meridian 0 of Greenwich
sanguineus
coccineus
rothschildi
gabunensis
ostrinus
maximus
centralis
frommi
minor
Miles
Kilometers

Fig. 1. Approximate distribution of the forms of *Pyrenestes* as recognized in the present paper.

The areas here assigned to the races of *P. ostrinus* and *P. minor* will be found very unlike those in previous revisions of the group, and I propose to show in the present paper not only on what grounds my taxonomic treatment rests, but also the interrelation between size—the most important subspecific attribute—and certain characteristics of the environment. This in turn may suggest reasons for the curious dispersal of the forms, as well as for their racial variations.

The various forms of *Pyrenestes* in Central and Western Africa are always lowland birds of sedentary habits. They are not known even from the slopes of Mounts Cameroon or Ruwenzori, and it might seem that nothing could prevent the mingling of stocks. It is, nevertheless, significant that no specimens have yet been taken in the forested region of the Ivory Coast. This is just the area that separates two of the best-marked groups, those of the northwest with no black in any plumage, and *Pyrenestes ostrinus,* black-and-red in adult males, occupying Lower Guinea.

Again, in crossing the central Congo basin, Lang and I saw no *Pyrenestes;* and as yet no specimens have come from the middle of that flat, forested area. Farther to the southeast the extension of *P. ostrinus* may be prevented by the rise in elevation toward Lake Tanganyika and its effect upon the vegetation. But, if these are the barriers, they have a more marked effect upon color than upon dimensions, because small birds, as well as larger ones, range almost entirely across the African continent.

Only two species of the genus were recognized by Professor Reichenow in 1904[1]; but Captain Shelley in the following year[2] listed four; and Professor O. Neumann[3] has since united them all in a single species, of which, however, he distinguished no less than seven distinct geographic races.[4]

Professor Reichenow had stated that everywhere large and small birds occurred together, as well as the most varied intermediate stages. He believed that adult males were always black-and-red, the females browner, save in the East African species.

Both these errors were corrected by Professor Neumann, who had examined the specimens in many European museums and was able to demonstrate a certain geographic variation in size, besides showing that the adult males of his *P. o. sanguineus, P. o. coccineus,* and *P. o. minor* always remained brown-and-red. Yet even this reviewer admitted that the question of the forms with black in the males was not yet settled.

During our long stay in the northeastern Congo, we collected a series of 30 specimens from Isangi and Stanleyville on the Upper Congo east and northward to Faradje, near the Lado Enclave. For us there could be no doubt as to the geographic segregation of large, small, and intermediate forms, although intergradation was rather complete. While the beak is the most striking feature with regard to size, its variation is usually correlated with that of the length of wing and even with the dimensions of the bird as a whole. But the measurement which best expresses the development of the beak is not that of the culmen, or from nostril to tip, but the greatest WIDTH of the lower mandible at the base of its sheath (measured with dividers).[1] The maxilla is rather short, and the length of its tip seems often to be altered as if by extreme wear of the horny sheath. Even the young, at the time they leave the nest, have the mandible of about the same width as their parents, whereas in length the beak is not yet fully developed.

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[1] 1904, 'Die Vögel Afrikas,' III, pp. 105–107.

[2] 1905, 'Birds of Africa,' IV, pp. 281–287.

[3] 1910, Journal für Ornithologie, LVIII, pp. 525–530.

[4] Mr. D. A. Bannerman, in a review which has appeared since the writing of my paper (1922, Revue Zool. Africaine, IX, p. 311), distinguishes the three species of *Pyrenestes,* but in the treatment of subspecies follows Neumann, except that he still recognizes *granti* and adds *frommi* as a race of *ostrinus.*

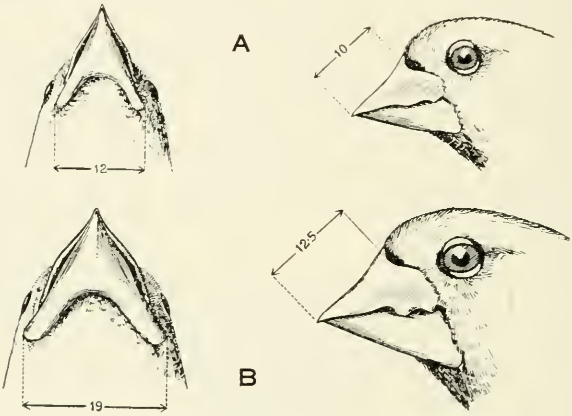

Fig. 2. Subspecific differences in the beak in one species of *Pyrenestes;* and method of measuring "width of mandible" and "bill from nostril."

A, *P. ostrinus rothschildi*, adult male from Avakubi, Ituri district. B, *P. ostrinus maximus*, adult male from Faradje, Upper Uelle district. Natural size.

In width of mandible, then, adult birds of our own small series varied from 10.2 mm. to 20 mm., covering almost the whole range of size throughout the genus, for only *Pyrenestes minor* ever has this measurement less than 10 mm. Specimens of small size, with width of mandible less than 14 mm., had been taken by us only in the region of dense equatorial forest; and those of intermediate dimensions (between 14 and

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[1] This measurement was first used by Cassin, I believe, in describing *P. coccineus;* but G. L. Bates is the only other writer who has employed it, 1911, Ibis, p. 588.

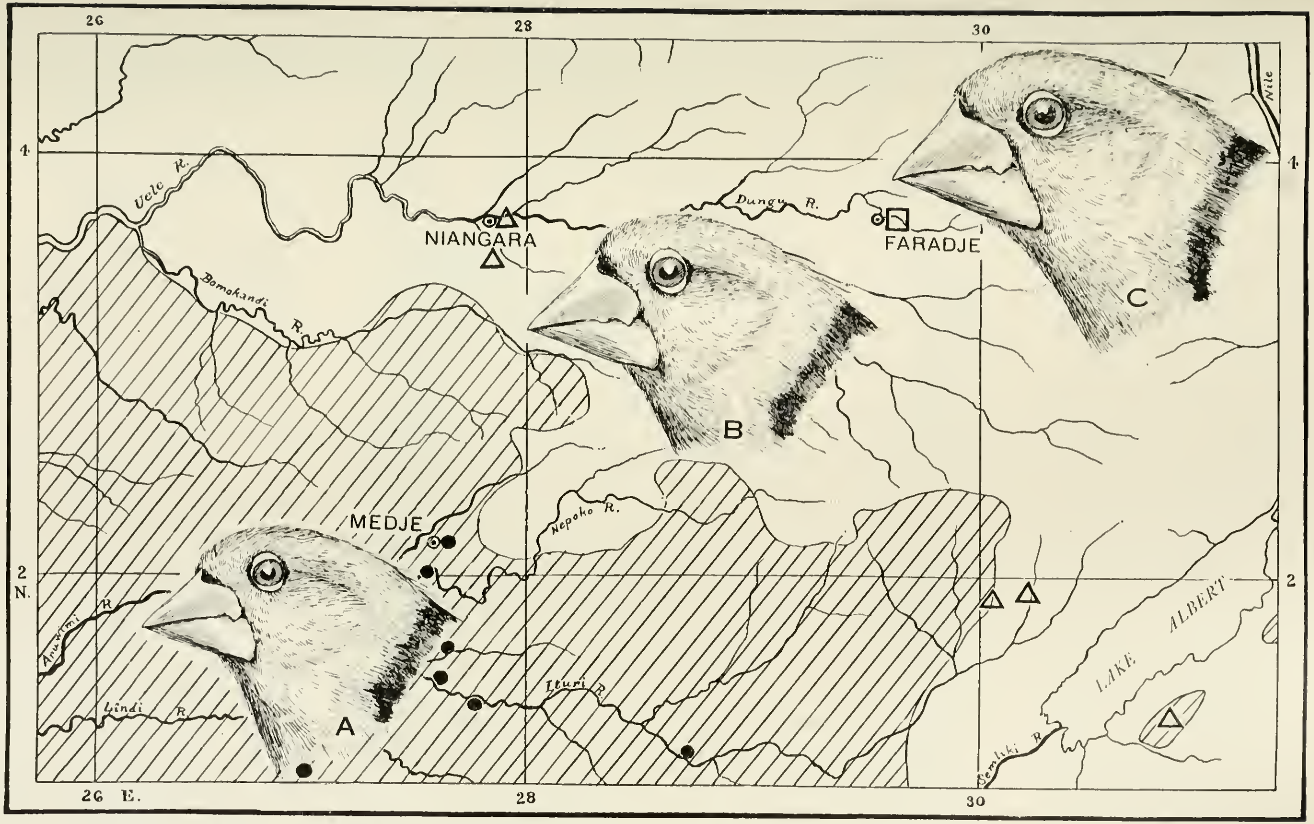
26
28
30
4
4
Nile
Uele R.
Dungu R.
NIANGARA
FARADJE
Bomokandi R.
C
B
MEDJE
Nepoko R.
2 N.
2
Aruwimi R.
LAKE ALBERT
Ituri R.
Lindi R.
A
Semliki R.
26 E.
28
30

Fig. 3. Map to illustrate the distribution of races of *Pyrenestes ostrinus* in the northeastern Congo basin.

The streaked area is unbroken forest, in which *rothschildi* (A) is known from the points marked with dots. Triangles are used to indicate occurrences of *ostrinus* (B), and a square for *maximus* (C). The birds' heads are drawn natural size.

16 mm.) only at Okondo's and at Niangara, along the border of the heavy forest; yet specimens of the largest size (17 to 20 mm.) had been secured not only at Faradje, well out in the northern savanna belt, but also at Stanleyville, on the Congo River, in the middle of the forest districts. In spite of the evident contradiction of my two Stanleyville specimens, it did seem as though the geographic distribution of the subspecies hinged upon the nature of the vegetation. (See Fig. 3.)

The Three Species and Their Variation

On the basis of the striking color differences of adult males, I conclude that the genus *Pyrenestes* is composed of three distinct species:

(1) *P. ostrinus*, with adult male largely pure black, but whole head, chest, and tail red. (Gold Coast south to Angola and east to Uganda.)

(2) *P. sanguineus*, similar in pattern, but the black completely replaced by brown. (Senegal to Liberia.)

(3) *P. minor*, brown-and-red, but the red of forehead and face (even in adult males) not extending to hind crown. (Tanganyika Territory south to Beira in Mozambique.)

P. sanguineus might in a way be described as a "hen-feathered" representative of *P. ostrinus*. Professor T. H. Morgan's work on this character in a domestic breed of fowls[1] has shown on how few genetic factors such a difference may depend, so *sanguineus* and *ostrinus* may in reality be more closely related, in a genetic sense, than my separation of them as distinct species would seem to indicate.

Of each of these three species there are larger and smaller subspecies, for since Neumann's revision an additional form has been described: *P. frommi* Kothe,[2] which I now regard as a large race of *minor*. Of the three species, *minor* is the most distinct, not only in color, but also in size.

When my measurements of mandibular width are tabulated according to species and sex (Fig. 4), it is seen that the small forms of *ostrinus* and *sanguineus* agree very closely, but that the small form of *minor* has a distinctly narrower bill. Moreover, the large form of *minor* does not by any means attain the dimensions of its larger cousins. This same chart also shows how slight is the sexual difference in this regard; it might almost have been left out of consideration. We have found, too, among

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[1] 'The Genetic and the Operative Evidence relating to Secondary Sexual Characters,' 1919, Carnegie Inst. Wash. Publication No. 285.

[2] 1911, Orn. Monatsber., XIX, p. 70. (Kitungulu, Urungu.)

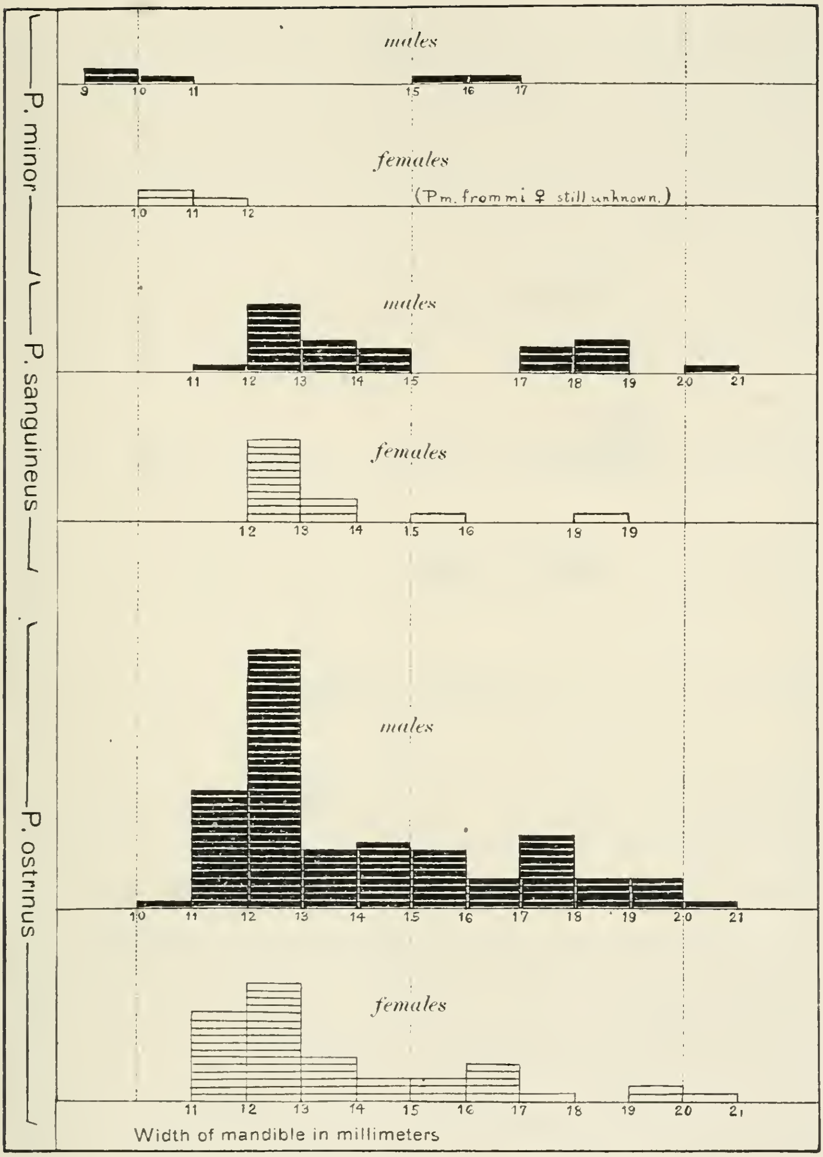

Fig. 4. Variation of mandibular width in the three species of *Pyrenestes*.

The sexes are separated, black polygons indicating males. Note the bimodal or polymodal nature of the polygons, showing that the populations are mixed.

individuals from one locality, that young birds with as yet no red feathers are approximately equal to their elders in width of bill, though not in length.

Further inspection of the combined frequency table will show at once the difficulty of dividing such a population as *P. ostrinus* into subspecies on the basis of size, unless the differences are well-marked geographically.

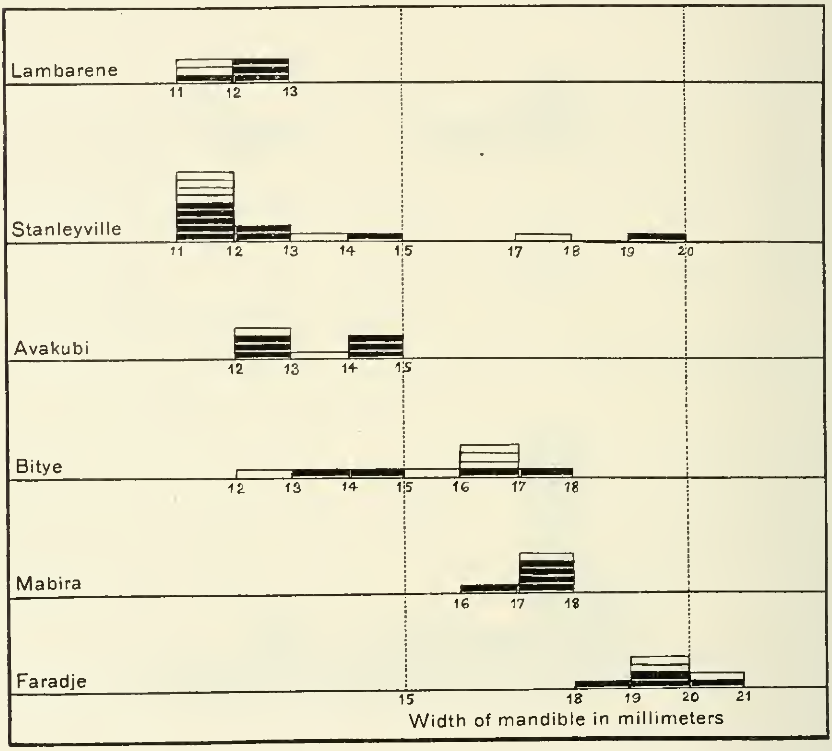

Fig. 5. *Pyrenestes ostrinus:* measurements of mandibular width, arranged according to locality.

Sexes united, but black rectangles indicate male specimens. At Stanleyville and Bitye the populations are mixed, presumably because of clearing of the forest.

Should we recognize races of three different sizes following Neumann, or only two; and, in either case, how are the limits to be fixed?

It is regrettable that no series of *Pyrenestes* exists large enough to render possible a truly statistical study. The largest number I have examined from any single locality is 15, from Stanleyville (Upper Congo), 13 of which were collected by Doctor C. Christy. Of Robin

Kemp's collecting I saw 13 from Bo (Sierra Leone); of G. L. Bates' from Bitye (Cameroon), 9; of Ansorge's from Lambarene (Gaboon), 6; while at Avakubi (Ituri) I collected 8, and at Faradje (Upper Uelle), 7. None of these, surely, is large enough to fix the variability for any single locality. Nowhere is *Pyrenestes* an abundant bird; in the Ituri Forest *P. ostrinus* is found in small numbers only in the clearings; in the Upper Uelle it is met but rarely, around patches of dense scrub near marshes or watercourses.

We do get an inkling, however, of the geographic variation in size for *P. ostrinus* by tabulating the measurements of even such small numbers by separate localities (Fig. 5). We see that in general Professor Reichenow was wrong in his assumption that large and small birds occurred together. Nevertheless, at Stanleyville[1] this is what really happens, and an explanation is needed. The two large-billed specimens were a male and a female taken by me, personally, close to the river and the government station, in 1909 and 1914. The thirteen small ones were collected by Doctor Christy in 1913 for the Tervueren museum; and, while they are all labeled Stanleyville, perhaps they were taken a little farther back from the river, where there was more forest. It seems possible that the larger subspecies may have invaded the forest region,

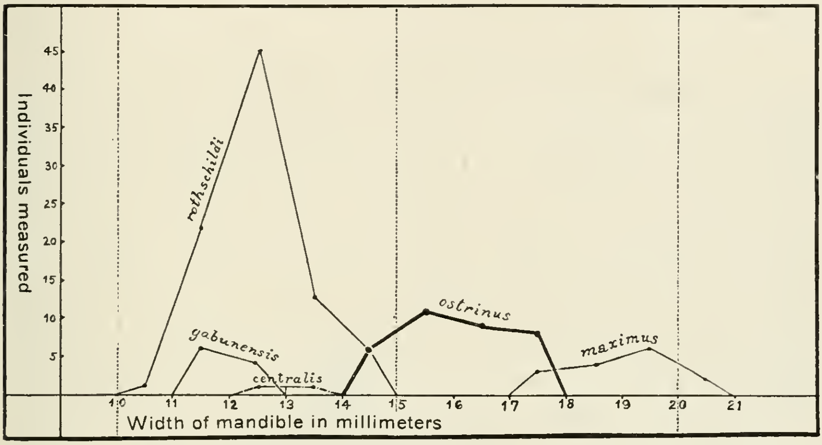

Fig. 6. Mandibular width in the races of *Pyrenestes ostrinus* as here recognized. Sexes united. Slight overlapping is shown between *rothschildi*, *ostrinus*, and *maximus*, while *gabunensis* is distinguished only on female color pattern, and *centralis* for its relatively larger body with longer wing.

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[1] Probably also at Bitye, as well as near Stanley Pool and in the Southern Gaboon.

coming down the Lualaba River,[1] whereas the smaller birds represent the indigenous forest stock, which I have found myself a little farther northwest, at Isangi.

The excess of small individuals, on the left of our frequency polygons for *P. ostrinus*, is due simply to the larger area occupied by them, especially near the West Coast, and the consequently greater chances of their falling into collectors' hands.

A frequency table for length of wing in the different species (Fig. 7) shows almost the same sort of variation as in the beak, but proportionately less, so that the bill measurement is more useful. The general correlation between bill and wing in size is also illustrated by the tables of measurements on pages 437 and 438.

Geographic Distribution in West and Central Africa

The statistical method being so ill-adapted to our problem, we must fall back upon the geographic. Noting upon a map of Africa the mandibular width for each locality (or the average width, when I had several measurements), I found that conditions as noted in the Ituri were more or less characteristic of Central and Western Africa. The smaller birds occur generally in the region of great forests and heavy rainfall. The very large ones, living in the savannas along the northern edge of the rain forest, extend from the Gambia to Mabira in Uganda. There are also indications that another group of rather large-billed birds skirts the southern edge of the forests, from the southern Gaboon eastward toward northern Angola. All this is illustrated by Fig. 11.

Pyrenestes sanguineus sanguineus and *P. s. coccineus* of Upper Guinea have been so well treated by Professor Neumann that I have little to add. An adult male of *sanguineus* has since been taken by Ansorge at Gunnal, Portuguese Guinea, and is now in the British Museum. Between these two races there seem to be few or no intermediates, unlike the case in *P. ostrinus*. Still it is quite possible that future collecting will reveal the connecting links in the region of Konakry (French Guinea).

The boundaries separating the ranges of *P. s. coccineus* and *P. ostrinus* appear to be situated on the Ivory Coast, and not in the grasslands of Togo, as one might have expected. On the forested Ivory Coast no specimens of the genus seem ever to have been taken, and this may be compared with our total lack of specimens from the Central Congo

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[1] Bishop-birds (*Pyromelana hordacea*) are likewise to be seen in the large clearings about Stanleyville and even farther down the Congo River.

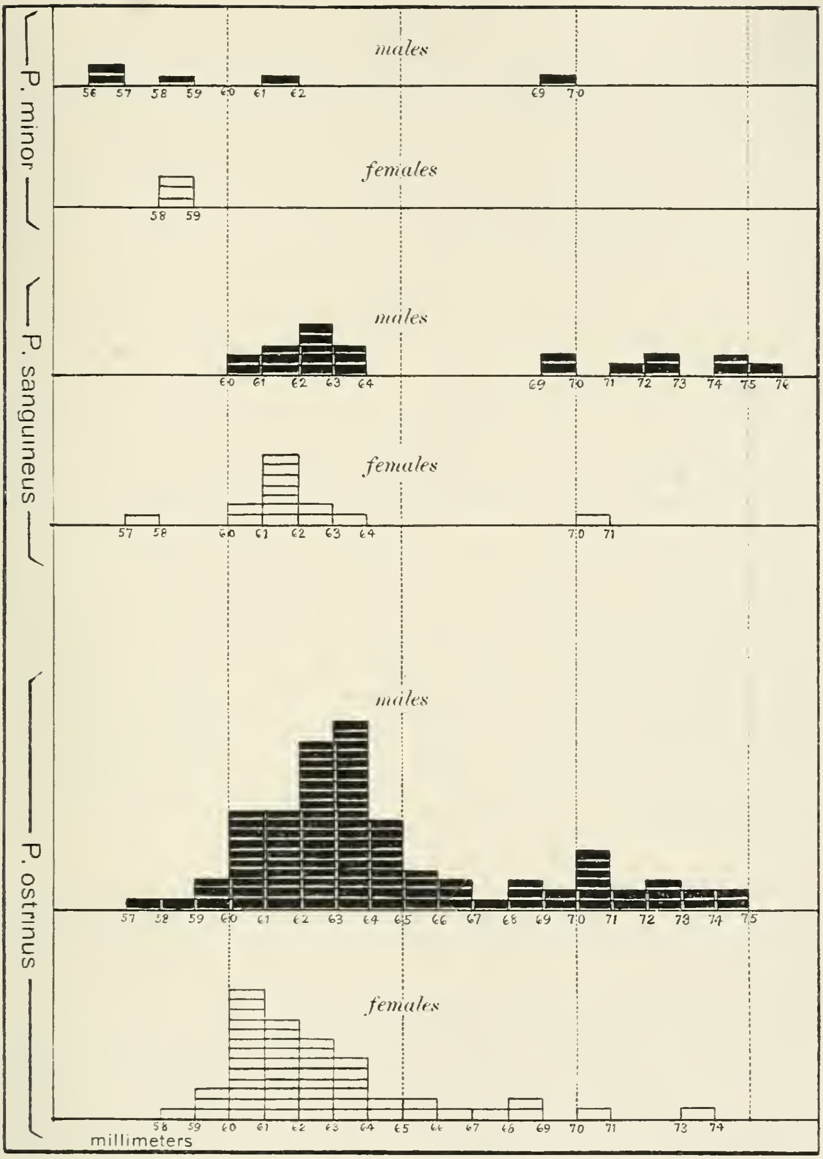

Fig. 7. Frequency table for wing-length in the three species of *Pyrenestes*, for comparison with that for width of mandible (Fig. 4).

Sexes separate, black polygons designating male specimens. Sexual difference is greater in length of wing than in size of beak.

forests. In the Gold Coast Colony the black-and-red males of *P. ostrinus* make their appearance in Fantee and even sixty miles west of Kumassi, where they already vary in size so as to represent the small and the intermediate races, while but little farther east, at Misahöhe (Togo), the large form first appears, extending thence northeast to the province of Zaria in North Nigeria. At the northwestern corner of the range of *P. ostrinus* we therefore find the same relation between forests and small size of the birds as at the northeastern corner, in the Upper Uelle and Uganda. On this point I should like to put particular stress. It explains why the small form which Neumann named *P. o. rothschildi* is the only one found in the delta of the Niger. This is the race that extends through the West African forests to the Lower Congo (Manyanga), and even eastward nearly to Beni, on the far edge of Congo territory.

Neumann erroneously referred the birds of the Lower Congo (Manyanga) and the Lower Uelle District (Buta) to his *P. o. gabunensis*, because he had only males, and the adults of this sex are indistinguishable in *gabunensis* and *rothschildi*. Our females from the Ituri, like all the others I have seen from the Congo, show by the extent of red that they cannot be included in *P. o. gabunensis*. Since seeing the females (including type) from Lambarene (Lower Ogowé River), I agree with Professor Neumann as to the distinctness of this Gaboon form in the females. There are three such in the museum at Tring, all from Lambarene and all agreeing closely, yet different from any others I have seen. The crown is red only on its anterior half, and the red of the throat is much restricted, not extending even to the chest. The brown of its back and belly, too, is somewhat darker and richer than usual in *rothschildi*, or even in the female of *P. s. coccineus*.

An adult female collected by Aschemeier at Ntyunga in the Fernand Vaz region of the Gaboon (and now in the U. S. Nat. Mus.) certainly approaches *gabunensis;* the red of the throat does not extend to the chest except as small spots or bars. But, on the whole, *P. o. gabunensis* appears to be confined closely to the Ogowé Basin.

Among the six specimens I found labeled simply "Gaboon" and collected by Aubry-Lecomte, Du Chaillu, and Verreaux, all but two were birds of small size. One adult male of Lecomte's measured 14.5 mm. across the mandible, and a male of Verreaux's 15 mm. This last was evidently one of the birds which Neumann thought had been wrongly labeled as to locality. I do not share his view, for not only is the existence of a rather large-billed form at Stanley Pool undoubted, but even in the Fernand Vaz region, at Omboué, Aschemeier has recently collected two adult males with mandibles 15 and 16 mm. wide. This even tends to bear out my theory, for an arm of the southern savanna does extend northward along the coast of the Gaboon to this point. Near the same spot Aschemeier also collected so typical a savanna bird as a bustard, *Lissotis melanogaster*.

Along the southern edge of the Congo forests conditions are not at all well known. This need not surprise us, for the bird collections thus far made in the Kasai and Manyema districts are very few.[1] Besides specimens of *Pyrenestes ostrinus* of the intermediate and even large size from Stanley Pool, there are two smaller ones collected in "Angola" by Mechow and Schütt. *P. o. rothschildi* extends southward as far as Golungo Alto, like not a few other forest species. No really large examples of *P. ostrinus* are known from Angola or the southeastern Congo, so here a wide gap in the probable range remains to be filled. If my large individuals from Stanleyville did come there from the south, we may expect to find birds of two or three sizes in the neighborhood of Kasongo on the Lualaba.

All this goes to show that three of the races of *Pyrenestes ostrinus*, instead of being restricted to small areas like "Lagos to North Cameroon," have in reality a very extensive distribution in zones roughly concentric around the whole of the Cameroon-Congo forest. The smallest form, *gabunensis*, is confined to the Ogowé basin; but whether we go from there to the north, east, or southeast, we shall always traverse regions where the birds become successively larger, until finally the bill has almost doubled in width, and the wing become 8 to 9 mm. longer.

NOMENCLATURE IN *Pyrenestes ostrinus*

We have shown in this species how variation in size is practically continuous. Neumann, it is true, recognized races of three sizes; and in this I shall follow him. If only a large and a small form were allowed, the variation within the subspecies would be far more pronounced than usual for a species among passerine birds; and even the eye alone can readily distinguish three classes.

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[1] Since this article went to press we have received from the Reverend R. Callewaert seven specimens of *Pyrenestes ostrinus* collected in the vicinity of the Mission of St. Joseph, near Luluabourg (Kasai District, Congo). Two more from the same locality have been loaned us by Dr. H. Schouteden. This series of seven adult males and two females shows a variation of nearly 5 mm. in the width of mandible, the average (for both sexes) being 13.9. This warrants extension of the range of *rothschildi* south to at least 6° on the Lulua River.

The males from Luluabourg St. Joseph are similar in color to those of *rothschildi* from the Ituri. Their dimensions are: wing 63–66 mm. (average 64.1); tail, 49–51 (50.0); beak from nostril, 10–11.5 (10.5); width of mandible, 12.4–16 (14.0); metatarsus, 18.2–19.8 (19.2).

The two females have bills of very unequal size, but agree in being rather dark brown on the body, like Ituri specimens in fresh plumage, with the red of the face extending back to the hind crown, over the whole of the ear-coverts, the malar region, and throat. There are red tips to the chest feathers, but no red lower down. Measurements: wing, 64 (both); tail, 50, 48; beak from nostril, 9.2, 10.9; width of mandible, 11, 15.8; metatarsus, 18.6, 19.

Fortunately it has been possible to correct the maps of distribution (Figs. 1 and 11) in accordance with this fuller knowledge. The annual rainfall at Luluabourg is known to average 60.7 inches; (see Fig. 10), so here again we have a confirmation of the rule that in a region of heavy rainfall small-billed birds are the rule.

Thus far we have not decided on the proper names for the intermediate and the largest forms of *P. ostrinus.* Professors Reichenow and Neumann, to be sure, considered the large form, then known only from Nigeria, as typical *ostrinus*, but my personal examination of Vieillot's type, still preserved in the Paris museum, showed it to be of the intermediate size. It is a black-and-red male, labeled "Type. Afrique Occidentale, No. 6479." From the size of the bird and the date of its collecting, it is practically certain that it came either from the eastern Gold Coast or from the Gaboon—in all events from the West Coast. Its measurements are: wing, 64; tail, 48; exposed culmen, 13; bill from nostril, 10; width of mandible, 15; metatarsus, 20.

In Vieillot's colored plate the wing is shown a little longer, about 71 mm., but comparison with specimens shows plainly that its beak is of the intermediate and not the largest dimensions. Inasmuch as his subject was expressly stated to be from the "Muséum d'Histoire Naturelle," I have no doubt as to the authenticity of the type. It might be argued that the name *ostrinus* would supersede *centralis* of Neumann. True it is that the Ituri specimens listed by Neumann as *centralis* are really very close to *ostrinus*—identical, I think,—but his type (♂ ad., Sesse Islands) has a smaller bill (mandibular width, 13) yet a longer wing (69 mm.) than in *ostrinus.* So I am in favor, rather, of regarding *centralis* as a small-billed race, restricted to the Sesse Islands and the adjacent shore of Lake Victoria. At Entebbe, Grauer collected an immature specimen sharing these peculiarities.

The large-billed form of parts of Uganda, the Upper Uelle, and Northern Nigeria, the most distinct of all the races, remained without a name until I described it as *Pyrenestes ostrinus maximus* in American Museum Novitates, No. 56, 1923, p. 8. The type specimen is an adult male from Faradje, on the northeastern edge of the Congo basin, well beyond the border of the rain forest. Its mandible measures 20.1 mm. across the base, and its other dimensions approach those of *P. sanguineus sanguineus*, notwithstanding the radical difference in color of the adult males.

The range of *maximus* includes the Guinean savannas, north of the Congo and Cameroon forests[1] from Lugalambo in Uganda, west to

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[1] The occurrence of *Pyrenestes o. maximus* in the northeastern Cameroon has since been definitely established. Mr. Hermann Grote writes me from Berlin that in the Tessmann collection there are two males of this large form, with wings of 72 and 74 mm., from Bozum, on the upper Uam River, 6° 25′ N. lat.

Misahöhe in Togoland. It must also occur in the savannas south of the Congo Forest, for it has been found at Stanley Falls and Stanley Pool.

The specimens reported by van Someren[1] as *P. coccineus* from Bale and Mubendi, in Uganda, can hardly be anything except *P. o. rothschildi*, there at the eastern extremity of its range. At Tring I did not see any of these small birds; but Dr. van Someren has kindly sent me the following measurements of a male in his collection: wing, 63 mm.; bill from nostril, 9.5; width of mandible, 12; tarsus, 18. The wing is not long enough to agree with the type of *centralis*. In Uganda, wrote van Someren in the Ibis, this small form "is found in the forests."

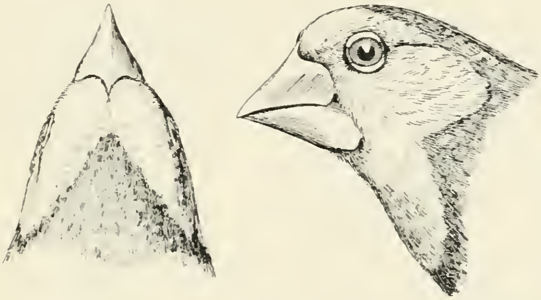

Fig. 8. Head of *Pyrenestes minor frommi*, adult male from the Uluguru Mts., Tanganyika Territory.

Crown and side views, to illustrate the distinctive color pattern of the species. Natural size, from a specimen in Lord Rothschild's museum.

GEOGRAPHIC DISTRIBUTION IN EAST AFRICA

Pyrenestes minor of East Africa is so rare in collections that its distribution must be very discontinuous. I cannot attempt to explain the reasons therefor, the region is one with which I am not familiar. There are, however, a small race, *minor*, and a larger one, which we shall call *frommi*.

The type of *P. frommi*[2] is in the Berlin museum, but my examination showed it to be so young as to give almost no information save as to size. It is still in complete juvenal plumage, without even a red feather about the face; but it does show that it represents a form far larger than *P. m. minor*, for its mandible is 16 mm. wide, and the wing 69 mm. in length.

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[1] 1916, Ibis, p. 414; 1922, Nov. Zool., XXIX, p. 145.

[2] 1911, Kothe, Orn. Monatsber., XIX, p. 70.

On purely geographic grounds one might associate it with the East African species; and the existence of a large form of *minor* is now proved by an adult male specimen recently collected in the Uluguru Mountains, Tanganyika Territory, by Mr. Arthur Loveridge, which I saw at the Tring museum. It has the mandible 15 mm. wide, the wing 62 mm. long, and is thus a little smaller than the type of *frommi*. Fig. 8, drawn from the head of this adult specimen, illustrates the restricted amount of red, even in the males, of the East African species.

But *P. m. minor* likewise occurs in the same mountains, as shown by a young bird also secured by Loveridge. So the distribution of these two races of the East African species offers a problem at least as complex as in the case of *P. ostrinus*.[1] That the small-billed race here again inhabits the more wooded districts is probable at least, for Claude Grant, who collected it near Beira, tells us: "It frequents densely wooded localities, spending all its time amongst the lower branches and undergrowth, and greatly resembles in all its actions *Lagonosticta niveoguttata*. The call is a loud 'zit.'"[2]

Food of *Pyrenestes*

From the great size of the jaw muscles in *P. ostrinus maximus* and the stout pyramidal form of the bill throughout the genus, one might be led to suppose that the birds' diet would be restricted to some very hard seeds, difficult to crush. Certainly the birds are largely granivorous, but the seeds found in the stomachs are frequently quite soft, so that, if there was a stout husk, it was entirely removed.

In six stomachs of the small-billed *P. o. rothschildi*, seeds were found in every case, sometimes soft white ones such as I found in stomachs of *Spermospiza*, but once recognizable as grains of rice, still green. Two of these same specimens of *rothschildi* had eaten three or more small spiders apiece, and another had swallowed small bits of green leaves. Their diet certainly does not consist altogether of hard seeds. Rice is probably well liked, for at Gamangui we saw them rather commonly in fields of mountain rice, a variety grown not in marshes but on upland clearings.[3] In Sierra Leone, Robin Kemp tells us[4] *P. sanguineus coccineus* is snared in the rice fields. This again is a small-billed form.

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[1] If further collecting at the southern end of Lake Tanganyika should reveal only adults of the *ostrinus* coloration, then *frommi* would probably become a synonym of *ostrinus* or replace *maximus*, and the large race of *minor* would require renaming.

[2] 1911, Ibis, (9) V, p. 227.

[3] A more slender-billed weaver-finch, *Pytilia schlegeli*, is extremely fond of this mountain rice.

[4] 1905, Ibis, (8) V, p. 239.

The larger *P. o. ostrinus*, nevertheless, is said to make use of its somewhat stouter beak in cracking hard seeds. Mr. G. L. Bates[1] writes that at the River Ja it "is found in swampy places overgrown with the sedges which the people used formerly to cut and burn to obtain salt from the ashes, and it feeds on their hard seeds."

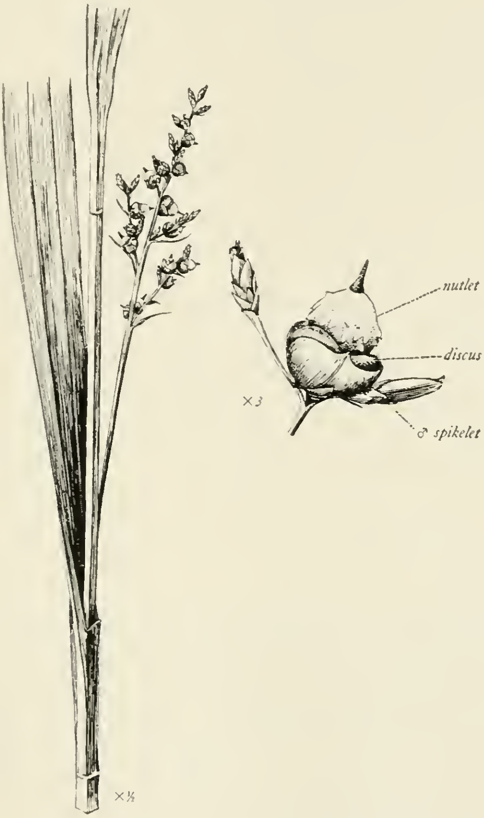

Fig. 9. *Scleria verrueosa* Wildenow, one of the group of hard-seeded sedges on which *Pyrenestes* feeds.

The nutlet has a heavy, stony shell. From a specimen collected at Malela, lower Congo River, by Dr. J. Bequaert. One-half natural size, the fruit three times enlarged.

In this connection it may be added that the sedges cannot be those of the common genus *Cyperus*, but belong rather, thinks Dr. Joseph Bequaert, to *Scleria*, a group commonly known as the razor grasses, which have extraordinarily hard, nut-like fruits. One of them is shown in Fig. 9.

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[1] 1911, Ibis, (9) V, p. 588.

Although represented by numerous species in tropical Africa, these troublesome plants, according to my recollection, are anything but common in the central Ituri, yet more so along the northern edge of the forest, just where the larger-billed forms of *ostrinus* were found. The razor grass grows along the borders of damp woods on low ground, where the shade is not very pronounced. Just here is where *Pyrenestes ostrinus ostrinus* is usually encountered.

I cannot fully confirm Mr. Bates' observations for *P. o. maximus*. There is likewise considerable razor grass in the places it frequents; but in the three stomachs examined, although I found seeds and nothing else, I was not able to establish their identity. It is very probable nevertheless that this large-billed race does use its beak to good advantage in feeding upon *Scleria* seeds. About Faradje, in the Uelle District, *P. o. maximus* was almost exclusively a swamp bird, usually found near small groups of trees and bushes.

The large-beaked races of the savannas may thus be able to crack seeds too stout for the small-billed birds of forest districts. They would do so by choice rather than of necessity, for many species of Ploceidæ with far weaker bills find an easy living in the same regions.

Possible Origin of Forms

The distribution of the genus as a whole would indicate a group plainly adapted to life in the occasional clearings or about the borders of the lowland equatorial forests—certainly not a typical savanna or plains group. We cannot regard the smaller races as degenerate in size, perhaps from a recent invasion of the forest. Rather would they be counted as the more primitive of the forms, because of a closer agreement with most other Estrildinæ, especially *Cryptospiza,* one of the few genera showing a resemblance to *Pyrenestes.*

The huge-billed *sanguineus* and *maximus* must certainly be regarded as the most specialized of the genus, offshoots perhaps of the forest-dwelling stock, profiting by some more favorable condition just beyond the edges of the great forests. Their apparent adaptation for feeding on the seeds of razor grasses seems to fit them for life along these border regions. If their distribution represents the area originally occupied by the genus, it must be that the more primitive survivors have been crowded into the forest region.

No great changes in the past distribution of the genus can be demonstrated, and I am inclined to believe that the factors governing size in the various subspecies are in operation today. Whatever favorable conditions may exist in the savannas of Nigeria and the Uelle District, they evidently do not obtain in the really open plains of Africa, for there the genus is quite lacking, nor has it any close representative among the Estrildinæ.

The changing outline of the equatorial forest belt in the past has doubtless exercised a marked influence, through a sort of isolation, over the development of color forms which we now call species. The presence of one species in East Africa may perhaps be attributed to an earlier extension of the equatorial forest, later isolated through climatic changes along the western "rift valley." But the correlation between vegetation and the size of the birds is certainly independent of effective isolation.

Any suspicion that altitude may be responsible for the increase of size culminating in *P. s. sanguineus* and *P. o. maximus* will be immediately dispelled by a comparison of my charts of distribution in *Pyrenestes* (Figs. 1 and 11) with an orographic map of tropical Africa. The latter will show not one point of similarity.

The range of *sanguineus* is mostly if not entirely below 1600 feet elevation. That of *maximus* from a few hundred feet in Nigeria rises to about 4000 feet in Uganda; and *rothschildi* is found from sea-level on the west coast to about 2800 feet in the Ituri. In East Africa the very small billed *P. minor* is found both at Beira on the coast and in the highlands of Zomba and Mlanji.

In examining a map of the mean annual rainfall of Africa,[1] I have been struck by the fact that the few localities where *Pyrenestes minor minor* has been taken coincide exactly with certain small areas of exceptionally heavy rainfall (over 60 inches), which are shown in the vicinity of Beira, of Zomba, and of Mahenge. Even the record from the Uluguru Mountains is within a country of over 40 inch rains, and one is tempted to predict that this small-billed *Pyrenestes* will some day be found at the north end of Lake Nyasa, where the annual precipitation attains 80 inches. There can be no doubt that the vegetation there reflects the character of the rainfall. My rainfall map in Fig. 10 is based on Knox's plate. As for the areas of heavy forest, it will be sufficient to note that they are generally similar to the region of over 60 inches rain, but slightly more restricted in size.

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[1] A. Knox, 1911, 'The Climate of the Continent of Africa,' Pl. I.

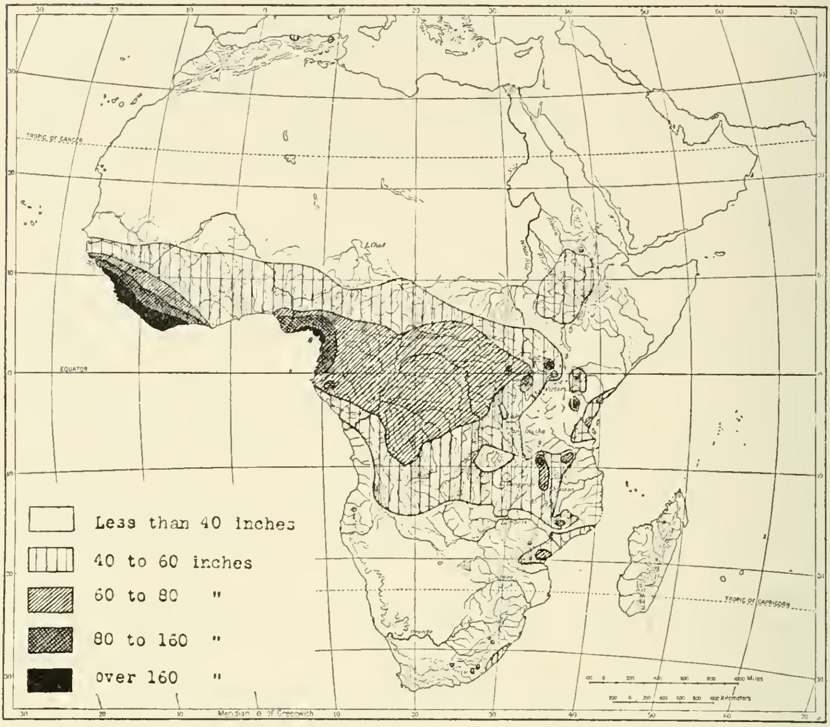
Less than 40 inches
40 to 60 inches
60 to 80 "
80 to 160 "
Over 160 "
Tropic of Cancer
Equator
Tropic of Capricorn
Meridian 0 of Greenwich
Miles
Kilometers

Fig. 10. Annual rainfall in continental Africa (after Knox).

A well-known African kingfisher, *Halcyon senegalensis,* varies geographically in color much as *Pyrenestes* does in size. Throughout the forests of the central Congo and Cameroon, as well as in those of Upper Guinea, in Sierra Leone at least, we find a subspecies with dark crown, *fuscopileus* of Reichenow, which is replaced along the border regions of the forest, from Senegambia to Uganda, by typical *senegalensis.* Still farther out in the open grass countries, both of the Sudan and of southern Africa, there is a lighter, brighter race known as *cyanoleucus.*

Conclusions

(1) Isolation is probably responsible for the color differences between the three species of *Pyrenestes,* but variation in size is dependent upon some other factor.

(2) In at least two of the species, *P. sanguineus* and *P. ostrinus,* the smallest individuals inhabit those regions where there are heavy rainforests, the largest ones usually the more open savannas of the West

African subregion. They are connected by birds of intermediate size, these being found especially along the border regions of the forest country.

(3) The average size of the birds' bills in any locality can be shown to give a rough index of the nature of the vegetation, or of the rainfall.

(4) It seems likely that a correlation exists between the greater size of the bill and a more restricted diet of hard seeds of certain sedges.

(5) *Pyrenestes minor* of Eastern Africa has likewise a larger and a smaller form, very similar to each other in coloration; but a corresponding difference in their habitats remains to be demonstrated.

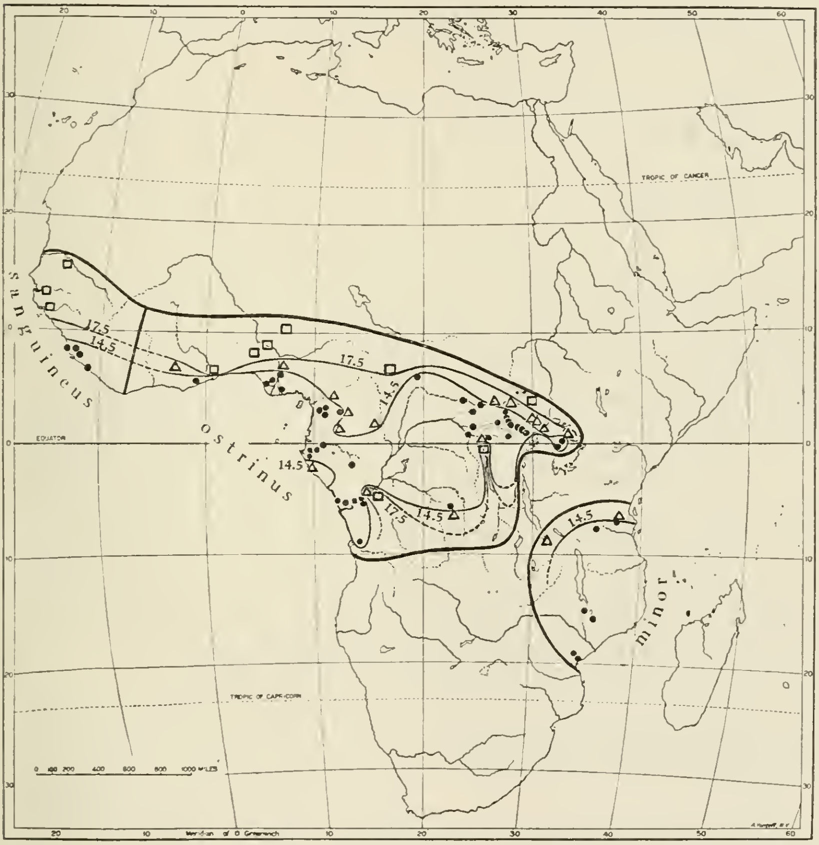
sanguineus
ostrinus
minor
17.5
14.5
17.5
14.5
14.5
17.5
14.5
14.5
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
0 100 200 400 600 800 1000 MILES
Meridian of Greenwich
20
10
0
10
20
30
40
50
60

Fig. 11. Geographic variation in size of beak for all three species of *Pyrenestes*.

Points where birds occur with mandible averaging less than 14.5 mm. wide are marked with a round dot. Triangles indicate localities for specimens with beak from 14.5 to 17.4 mm. wide; and squares those of 17.5 mm. or over. Most of the known occurrences are represented. Note the parallel variation in different species, and compare this map with that for rainfall in Fig. 10, also with a botanical map of Africa, as in Bull. Amer. Mus. Nat. Hist., XXXIX, 1918, p. 19.

AIDS TO IDENTIFICATION

Modifying Professor Neumann's key, especially by the use of mandibular width in place of length of culmen, we offer the following table for adult birds only. Young birds in plain brown juvenal dress can only be determined if the locality is known whence they come.

Even among normal adults of *P. ostrinus*, a small proportion of intermediate specimens may be expected that cannot satisfactorily be referred to any one subspecies.

1. Body color largely black.......2.
Body color without black.......5.

2. Mandible wider than 17.5 mm., wing usually exceeding 67 mm. ♂ *P. o. maximus.*
Mandible less than 17.5 mm. wide.......3.

3. Mandible over 14.5 mm. wide....... ♂ *P. o. ostrinus.*
Mandible less than 14.5 mm.......4.

4. Wing over 66 mm....... ♂ *P. o. centralis.*
Wing under 66 mm....... { ♂ *P. o. rothschildi.* ♂ *P. o. gabunensis.* }

5. Body color warm reddish olive-brown.......6.
Body color grayish brown.......11.

6. Bill very large, mandible over 17.5 mm. wide.......7.
Bill smaller, mandible less than 17.5 mm.......8.

7. Whole head glossy red, this color including nape and chest, extending to sides of breast....... ♂ *P. s. sanguineus.*
Red areas more restricted, less definite, brown color showing basally at least on feathers of nape and chest....... { ♀ *P. s. sanguineus.* ♀ *P. o. maximus.* }

8. Whole head glossy red, this color including nape and chest, extending to sides of breast....... ♂ *P. s. coccineus.*
Red areas more restricted, not so well defined.......9.

9. Red of face extending a little beyond middle of crown, at least as red feather tips; feathers of upper chest tipped at least with red.......10.
Red of face not extending to posterior part of crown, nor to chest. ♀ *P. o. gabunensis.*

10. Mandible 14.5 to 17.5 mm. wide....... ♀ *P. o. ostrinus.*
Mandible less than 14.5 mm....... { ♀ *P. s. coccineus.*[1] ♀ *P. o. rothschildi.* }

11. Beak larger, mandible over 13 mm. wide....... ♂, ♀ *P. m. frommi.*
Beak smaller, mandible usually under 12 mm. wide....... ♂, ♀ *P. m. minor.*

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[1] *P. o. centralis* ♀, though still unknown, would probably fall in this group, but could be distinguished presumably by its longer wing, over 66 mm.

Measurements[1] of All Type Specimens in the Genus *Pyrenestes*

	Wing	Tail	Bill (from Nostril)	Width of Mandible	Metatarsus
coccineus (male)	61.5	49.0	8.8	12.5	18.8
personatus (female)	70.5	57.0	11.0	18.0	20.5
sanguineus (male)	71.1	63.5	....	....	19.0
gabunensis (female)	60.0	46.4	9.8	11.8	18.7
rothschildi (male)	63.0	48.0	8.5	12.2	19.1
centralis (male)	66.5	54.0	10.1	13.0	20.0
ostrinus (male)	64.0	48.0	10.0	15.0	20.0
maximus (male)	73.0	55.5	12.0	20.1	22.5
granti (male)	58.0	49.2	....	9.4	17.5
minor (apparently female)	58.0	52.0	8.0	10.5	18.0
frommi (juv.)	69.0	56.5	9.6	16.0	21.0

DISTRIBUTION OF FORMS, AND LIST OF SPECIMENS EXAMINED

Pyrenestes sanguineus sanguineus Swainson

Pirenestes sanguineus SWAINSON, 1837, 'Birds W. Africa,' I, p. 156, Pl. IX and p. 159, fig. 1 (type locality: Senegal).

Pyrenestes personatus DU BUS, 1855, Bull. Ac. Brux., p. 151 (type locality: Senegal).

FIGURES.—One of the adult male, in color, and another of its beak accompany Swainson's original description. The first of these has been copied by Reichenbach, 1862, 'Die Singvögel als Fortsetzung der vollständigsten Naturgeschichte,' Pl. XXI, fig. 179.

RANGE.—Senegal to Portuguese Guinea.

SPECIMENS EXAMINED.—Philadelphia: 1 ♂ ad., "West Africa."

London: 2 ♂ ad., R. Gambia (Whitely); 1 ♂ ad., Gunnal, Port. Guinea (Ansorge); 1 ♂ ad., "W. Africa"; 2 ♂ ad., without locality.

Tring: 1 ♂ ad., "W. Africa."

Brussels: 1 ♀ ad., Senegal (type of *personatus* Du Bus).

Pyrenestes sanguineus coccineus Cassin

Pyrenestes coccineus CASSIN, 1848, Proc. Phil. Acad., p. 67 (type locality: Sierra Leone and Monrovia, Liberia).

FIGURE.—The adult male, in color, Cassin, 1849, Journal Acad. Nat. Sci., Philadelphia, I, Pl. XXXI, fig. 2.

RANGE.—Sierra Leone and Liberia.

SPECIMENS EXAMINED.—Philadelphia: 1 ♂ ad., "W. Africa" (type of *coccineus* Cassin).

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[1] Those for *sanguineus* were given in inches by Swainson (1837), the remainder were all taken by the author from the actual specimens.

Measurements (Extremes and Average) for All Recognized Forms of *Pyrenestes*

		WING	TAIL	BILL (FROM NOSTRIL)	WIDTH OF LOWER MANDIBLE	METATARSUS
P. s. sanguineus	8 ♂ 1 ♀	69 -74.5(72.1) 70.5	53.5-61.5(57.6) 57	11.1-12.5(12.0) 11	17.5-20 (18.2) 18	20.5-22.5(21.2) 20.5
P. s. coccineus	17 ♂ 15 ♀	60 -63 (61.7) 57 -63 (60.9)	46.6-50 (48.0) 44 -51 (47.4)	8.6-10 (9.2) 8.5-10.3(9.2)	11.9-14.4(12.8) 12 -15 (12.6)	17 -19.8(18.3) 18 -20 (18.7)
P. o. maximus	11 ♂ 3 ♀	65 -74 (70.6) 68 -70	50 -61 (56.1) 54 -57	12 -13.3(12.4) 12.6-13	17.5-20.1(18.6) 19 -20	20 -23 (21.2) 19 -22
P. o. ostrinus	24 ♂ 13 ♀	62 -73 (66.3) 62.5-73 (64.9)	47 -59 (52.0) 47.8-58 (51.9)	10 -12.5(11.1) 10 -12 (10.9)	14.5-17.6(15.9) 14.5-17 (15.7)	18.5-22 (20.1) 19 -22 (19.9)
P. o. centralis	2 ♂ No ♀	66.5, 70	54, 56	10.1, 9.1	13, 12.6	20, 22
P. o. rothschildi	54 ♂ 36 ♀	58.6-67 (61.9) 58 -68 (61.1)	42 -53 (47.9) 43 -52 (47.3)	8.4-11 (9.2) 8.4-10.2(9.1)	10.2-14.5(12.3) 11 -14 (12.2)	17.5-20.5(18.8) 17.4-20 (18.7)
P. o. gabunensis	8 ♂ 3 ♀	57.5-63 (61.2) 60 -61	43.5-50 (46.9) 45.5-47	8.3- 9.7(9.1) 9 - 9.8	11.3-12.8(11.9) 11.5-11.8	17 -19.2(18.4) 18.5-18.7
P. m. minor	3 ♂ 3 ♀	56 -58 58 -58.5	49 -50.4 52 -53	7 - 7.5 7.5- 9	9.4-10.2 10 -11	17.5-18.7 18 -19
P. m. frommi	2 ♂ No ♀	62, 69	54, 56.5	11, 9.6	15, 16	20, 21

London: 5 ♂ ad., 4 ♀ ad., Bo, Sierra Leone (Kemp); 2 ♂ ad., Freetown (W. P. Lowe); 1 ♀ ad., Sierra Leone (W. P. Lowe); 1 ♂ ad., Rotifunk, S. Leone (Kelsall); 1 ♀ ad., Grassfields, S. Leone (Kelsall).

Tring: 1 ♀ ad., Sierra Leone (Bower); 2 ♂, 2 ♀, Bo, S. Leone (Kemp); 2 ♀, Freetown (Kelsall); 1 ♂, 1 ♀, Grassfields, S. Leone (Kelsall); 1 ♂, Clive Town, S. Leone; 1 ♂, Jagbamah, S. Leone (Kemp); 1 ♀, Whitefield, Liberia (Stampfli); 1 juv., Grand Cape Mount, Liberia; 2 ♂, Robertsport, Liberia (Demery).

Berlin: 1 ♂, 1 ♀, Liberia (Stampfli).

Munich: 1 ♀, Golaland, Liberia (Sherer).

Pyrenestes ostrinus maximus Chapin

Pyrenestes ostrinus maximus Chapin, 1923, Amer. Mus. Novitates, No. 56, p. 8, Fig. 5 (type locality: Faradje, N. E. Belgian Congo).

Figures.—The head of the young bird is shown by Chapin, 1917, Bull. Amer. Mus. Nat. Hist., XXXVII, Pl. vi, fig. 3. For the beak of the adult male see p. 418 of the present paper.

Range.—Across the northern Guinean savannas from Togoland and Northern Nigeria eastward to the Upper Uelle District and Uganda. Likewise to be expected in the southern Guinean savanna, inasmuch as it is known from Stanley Pool and Stanleyville on the Upper Congo.

Specimens Examined.—American Museum: 4 ♂ ad., 1 ♂ juv., 2 ♀ ad., 2 ♀ im., Faradje, Upper Uelle Distr., 1 ♂ ad., Stanleyville (Congo Exp.).

London: 1 ♂ ad., Shonga, Niger R. (Forbes).

Tring: 1 ♂ ad., Kaduna R., N. Nigeria (Poggiolini); 1 ♂ ad., Illorin, N. Nigeria (Bryan); 1 ♂ ad., Lugalambo, Uganda (van Someren).

Berlin: 1 ♂ ad., Misahöhe, Togo (Baumann); 1 ♂ ad., Stanley Pool (Teusz).

Pyrenestes ostrinus ostrinus (Vieillot)

Loxia ostrina Vieillot, 1805, 'Oiseaux Chanteurs,' p. 79, Pl. xlviii (type localities: "Africa and India"; I propose restriction to southern Gaboon coast).

Figures.—The original description is accompanied by a colored plate of the adult male. Reichenbach, 1862, 'Die Singvögel als Fortsetzung der vollständigsten Naturgeschichte,' Pl. xxi, fig. 178, again figured in color the same sex of this bird.

Range.—From the interior of the Gold Coast eastward along the northern edge of the Cameroon and Congo forests to the Lendu Plateau, and the Bugoma and Mabira Forests in Uganda. Also along the southern edge of the great forest, from the Fernand Vaz region eastward to Stanley Pool and Angola, while a rather large female has been taken at Stanley Falls.

Specimens Examined.—American Museum: 2 ♀ ad., 2 ♀ juv., Niangara, Uelle Distr.; 1 ♀ ad., Stanleyville (Congo Exp.); 1 ♀ im., Gaboon (Verreaux).

Toronto: In the collection of Mr. J. H. Fleming, 1 ♀ ad., Mabira, Uganda (Hughes).

Washington: 2 ♂ ad., Omboué, Fernand Vaz region (Aschemeier).

London: 1 ♂ ad., Bibiani, Gold Coast; 1 ♂ ad., Agouleri, Nigeria (Kemp); 2 ♂ ad., 1 ♀ ad., River Ja, S. Cameroon (Bates); 1 ♂ ad., Gaboon (Verreaux); 1 ♀ juv., Pompari, R. Uelle (Alexander); 1 ♂ ad., Tingasi, Uelle Distr. (Emin); 1 ♂ ad., Mpumu, Uganda (Seth-Smith).

Tring: 1 ♂ ad., Agouleri, Nigeria (Kemp); 1 ♂ im., 3 ♀ ad., River Ja (Bates); 1 ♂ ad., Ituri Forest, near Irumu (Camburn); 3 ♂ ad., Mabira, Uganda (van Someren).

Paris: 1 ♂ ad., "Afrique Occidentale" (type of *ostrinus*); 1 ♂ ad., West Africa (Brazza and Pecile); 1 juv., Brazzaville (Dybowski).

Frankfort : 1 ♂ ad., Molundu, S. Cameroon (Schultze); 1 ♀ ad., Angu, Uelle R. (Schubotz).

Berlin: 1 ♀ ad., Yaunde, S. Cameroon (Zenker); 1 ♂ im., Nkolentangan, Sp. Guinea; 1 ♂, Angola (Schütt); 1 ♀ ad., Duki R., Eastern Ituri Distr. (Stuhlmann).

Dr. V. G. L. van Someren sends me measurements of: 1 ♀ ad., Bugoma Forest; 1 ♂ ad., Kyetume, Uganda; 2 ♂ ad., Mabira Forest, Uganda.

Pyrenestes ostrinus centralis Neumann

Pyrenestes ostrinus centralis O. Neumann, 1910, Journal für Ornithologie, p. 529 (type locality: Sesse Islands, Lake Victoria).

Figure.—None.

Range.—Sesse Islands and adjacent portion of Uganda.

Specimens Examined.—Tring: 1 ♂ juv., Entebbe (Grauer).

Berlin: 1 ♂ ad. (type of *centralis*), Sesse Islands (Stuhlmann).

Pyrenestes ostrinus rothschildi Neumann

Pyrenestes ostrinus rothschildi O. Neumann, 1910, Journal für Ornithologie, p. 528 (type locality: Warri, Southern Nigeria).

Figure.—For head and beak, see p. 418 of the present paper.

Range.—Fantee (Gold Coast), eastward through forests of S. Nigeria, Cameroon, and Congo to Mawambi in Upper Ituri. Southward also to the Lower Congo and Northern Angola.

Specimens Examined.—American Museum: 2 ♂ ad., Isangi, Distr. Aruwimi; 1 ♂ im., Boyulu, Distr. Stanley Falls; 1 ♀ im., Ngayu, Ituri Distr.; 6 ♂ ad., 1 ♂ im., 2 ♀, Avakubi, Ituri Distr.; 1 ♂ ad., Gamangui, Nepoko R.; 1 ♂ ad., Medje, Ituri Distr. (Congo Exp.).

Cambridge (Mass.): 1 ♂ ad., Sakbayeme, Cameroon (G. Schwab).

Philadelphia: 1 juv., River Camma, Gaboon (Du Chaillu).

Pittsburgh: 2 ♀ ad., Lolodorf, S. Cameroon; 1 ♀ ad., Efulen (Reis).

Washington: 2 ♂ ad., Efulen (Bates); 2 ♀ ad., Fernand Vaz region (Aschemeier).

London: 1 ♂ ad., Fantee (Swanzy); 2 ♀ ad., Gold Coast (Kirby); 1 ♀ ad., Fantee (Gardner); 1 ♂ ad., Agouleri, Nigeria (Kem p); 1 ♀ ad., Abutschi, S. Nigeria (Kemp); 1 ♀ ad., Burutu, S. Nigeria (Kemp); 1 ♂ ad., 1 ♀ ad., River Ja, S. Cameroon (Bates); 1 ♀ ad., Gaboon (Verreaux); 1 ♂ im., Gaboon (Du Chaillu); 1 ♀ ad., Leopoldville, Congo (Bohndorff); 2 ♂ ad., Yambuya, Aruwimi R. (Jameson); 1 ♂ ad., Bosobangi, Ituri R. (Christy); 1 ♂ ad., Mawambi, Ituri R. (Woosnam).

Tring: 3 ♂ ad. (including type of *rothschildi*), 2 ♀ ad., Warri, S. Nigeria (Roth); 1 ♂ ad., Abutschi, S. Nigeria (Kemp); 2 ♂ ad., 1 ♀ im., Degama, S. Nigeria (Ansorge); 2 ♂ ad., 4 ♀ ad., Buguma, S. Nigeria (Ansorge); 1 ♂ im., Manyanga, Lower Congo (Bohndorff); 1 ♂ ad., Golungo Alto, Angola (Ansorge); 1 ♂ ad., Buta, Lower Uelle Distr. (Val. Meregaglia).

Paris: 1 ♀ ad., Gaboon (Du Chaillu); 1 ♂ ad., Gaboon (Aubry-Lecomte); 1 ♂ ad., Franceville, Gaboon (Schwébisch); 1 ♂ ad., Upper Kemo River, near Ubangi (Dybowski).

Tervueren: 1 ♀ ad., Lower Congo (Schouteden); 1 ♀ im., Kisantu (Goosens); 1 ♂ im.; Leopoldville (Christy); 9 ♂ ad., 4 ♀ ad., Stanleyville (Christy); 1 ♂ ad., Bosobangi, Ituri R. (Christy).

Frankfort: 1 ♀ ad., Bondo, Uelle R. (Schubotz).

Berlin: 1 ♂, 1 ♀, Cameroon (Zeuner); 1 ♂ ad., Elododo, Cameroon; 1 ♂ ad., 1 ♂ im., B'pindi, Cameroon; 1 ♂ im., Molundu, S. Cameroon (Schultze); 1 ♂ ad., Gaboon; 1 ♂ ad., Chinchoxo (Falkenstein); 1 ♂ ad., 1 ♀ im., Manyanga (Bohndorff); 1 ♂, Angola (Mechow); 1 ♀, Angola (Schütt).

Vienna: 1 ♀, Mawambi, Ituri R. (Grauer): 1 ♀, Mawambi-Beni (Grauer).

Pyrenestes ostrinus gabunensis Neumann

Pyrenestes ostrinus gabunensis O. NEUMANN, 1910, Journal für Ornithologie, p. 528 (type locality: Lambarene, Lower Ogowé River).

FIGURE.—Reichenbach's colored figure, 1862, 'Die Singvögel,' Pl. XXI, fig. 180, may well be of the male of this form, for a specimen collected by Verreaux in the Gaboon, he said, was in the Dresden Museum. On the other hand, it cannot of course be distinguished from the male of *rothschildi*.

RANGE.—Confined to Gaboon, particularly the basin of the Ogowé.

SPECIMENS EXAMINED.—Tring: 4 ♂ ad., 3 ♀ ad. (including type of *gabunensis*), Lambarene, Gaboon (Ansorge); 3 ♂ ad., Abanga River, Gaboon (Ansorge).

Paris: 1 ♂ ad., Achouka, Lower Ogowé R. (Dybowski).

Pyrenestes minor minor Shelley

Pyrenestes minor SHELLEY, 1894, Ibis, p. 20 (type locality: Zomba and Milanji Plains, Nyasaland).

Pyrenestes granti SHARPE, 1908, Bull. Brit. Orn. Club., XXI, p. 67 (type locality: Beira, Mozambique).

FIGURE.—The adult female is shown in color by Shelley, 1905, 'Birds of Africa,' IV, Pl. XXXV, fig. 1.

RANGE.—Scattered localities from Uluguru Mts. (Tanganyika Terr.) south to Beira in Mozambique.

SPECIMENS EXAMINED.—London: 1 ad. [in ♀ plumage], Zomba (Whyte); 1 ad., [in ♀ plumage], Milanji Plateau (Whyte) (types of *minor*); 1 ♂ ad. (type of *granti*), Beira (C. Grant); 1 ♂ im., Masambeti, Port. E. Afr. (C. Grant).

Tring: 1 ♂ im., Uluguru Mts. (Loveridge).

Berlin: 1 "♀." Sanji, Mahenge, E. Afr. (Münzner). Professor O. Neumann agrees with me in thinking this specimen to be wrongly sexed.

Pyrenestes minor frommi Kothe

Pyrenestes ostrinus frommi KOTHE, 1911, Ornithologische Monatsberichte, p. 70 (type locality: Kitungulu, Urungu, E. Africa).

FIGURE.—For head and beak of the male, see p. 429 of the present paper.

RANGE.—Urungu, at south end of Lake Tanganyika, and Uluguru Mts., Tanganyika Territory.

SPECIMENS EXAMINED.—Tring: 1 ♂ ad., Uluguru Mts. (Loveridge).

Berlin: 1 ♂ im. (type of *frommi*), Kitungulu (Fromm).

59.9,82C(67.5)

Article V.—OBSERVATIONS ON *COLOBUS* FETUSES[1]

By Adolph H. Schultz[2]

At present we have an exceedingly limited literature on the fetal development of monkeys and apes, so that any new observation in this line is a contribution to a practically unknown field. In the study of fetal material of primates the changes in proportions during development are of special interest, particularly when compared with the conditions in adults of corresponding species. Such investigations should eventually reveal the general laws governing growth in all primates, and also the reasons for and the time of appearance of the various physical specializations found in this group of mammals.

The following notes form a small contribution in this direction. They have been made possible through the generous loan, by The American Museum of Natural History, of three fetuses and two adult skeletons of the *Colobus* monkey. In addition, use has been made of observations on the preserved bodies of one juvenile and one adult *Colobus* monkey in the anatomical collection of the University of Zürich. The author wishes to express his sincerest thanks to Dr. F. A. Lucas and Mr. H. Lang, of the American Museum, and to Prof. W. Felix, of the University of Zürich, for their kind permission to study this material.

Two of the fetuses (1 and 2) and one skeleton (4) belong to the species *Colobus abyssinicus ituricus;* one fetus (3) and one skeleton (5) to *Colobus angolensis cottoni;* and the two preserved bodies (6 and 7) are of the species *Colobus vellerosus* J. Geoffroy.[3] In their state of development the three *Colobus* fetuses correspond closely to human fetuses of the 20th to the 24th week; in all probability, however, their actual age is not so great as that. A careful comparison of the lanugo, cutaneous ridges, ears, hands and feet, genitals, and especially the ossification, in the *Colobus* and the human fetuses, shows that *Colobus* fetus 1 corresponds to a human fetus of 20 weeks, fetus 2 to one of 23 weeks, and fetus 3 to one of 24 weeks. The *Colobus* fetuses are considerably smaller, however, than the human fetuses of corresponding stages of development. This is best shown by their respective sitting-height (crown-rump)

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[1] Scientific Results of the American Museum Congo Expedition. Mammalogy, No. 9.

[2] Research Associate, Department of Embryology, Carnegie Institution of Washington.

[3] The following are the catalogue numbers of the different collections. American Museum of Natural History: 1, 52250; 2, 52246, 3, 52192; 4, 52223; 5, 52149. Anatomical collection, University Zürich: 6, 589; 7, 98. Carnegie Laboratory of Embryology: 1, C 38; 2, C 35; 3, C 37. With the exception of skeleton 5 all these specimens are female.

Table I.—Absolute Measurements of *Colobus* Fetuses

No.	Measurements (in millimeters)	*Colobus* Fetus 1	*Colobus* Fetus 2	*Colobus* Fetus 3
1.	Sitting height: Top of head to lowest point on buttocks	112.0	134.0	147.0
2.	Thoraco-abdominal height: Symphysion (upper border of symphysis pubis) to suprasternal notch	59.0	71.0	85.0
3.	Symphysion to nipple (the latter projected on midsagittal plane)	50.5	61.0	74.0
4.	Symphysion to omphalion (center of attachment of umbilical cord)	22.0	24.0	26.0
5.	Biacromial diameter: Distance between the acromial processes	26.8	35.0	34.0
6.	Bimammillary diameter: Distance between niples	12.5	15.0	14.5
7.	Bitrochanteric diameter: Distance between the great trochanters	24.0	29.0	28.0
8.	Transverse diameter of chest (at nipple height)	24.0	30.0	32.0
9.	Sagittal diameter of chest (at nipple height)	23.0	31.0	31.0
10.	Circumference of chest (at nipple height)	85.0	103.0	106.0
11.	Length of upper arm: Top of caput humeri to humero-radial joint (radiale)	30.0	35.5	40.0
12.	Length of forearm: Radiale to tip of styloid process (stylion)	26.1	33.5	36.7
13.	Length of hand: Middle of line combining styloid processes of radius and ulna to tip of middle finger	21.5	30.5	34.0
14.	Length of thumb: Stylion to tip of thumb	9.6	9.3	10.4
15.	Breadth of hand (across metacarpo-phalangeal joints II to V)	8.9	11.6	12.0
16.	Length of thigh: Top of great trochanter to lateral point of knee joint	33.0	41.5	46.7
17.	Length of leg: Medial point of knee joint (tibiale) to tip of internal malleolus	29.3	35.8	40.0
18.	Tibiale to sole of foot	32.0	41.0	45.5
19.	Length of foot: Heel to tip of longest toe	34.3	46.0	49.5
20.	Breadth of foot (across metatarso-phalangeal joints II to V + breadth of this joint on great toe)	10.2	13.0	13.0
21.	Greatest length of head: Glabella to most distant point on occiput	36.0	44.0	50.5
22.	Greatest breadth of head (over temporal or parietal bones)	30.5	38.0	41.0
23.	Auricular height of head: Tragion (upper border of tragus) projected on midsagittal plane to vertex (perpendicular to ear-eye horizon)	21.5	27.5	29.0
24.	Nasion-inion diameter: Point over middle of naso-frontal suture (nasion) to occipital protuberance (inion)	35.0	41.5	48.5

Table I.—Absolute Measurements *Colobus* Fetuses (Continued)

No.	Measurements (in millimeters)	*Colobus* Fetus		
		1	2	3
25.	Biauricular breadth: Width between the tragion points	28.5	35.0	37.0
26.	Horizontal circumference of head (greatest circumference passing through glabella)	107.0	129.0	145.0
27.	Sagittal arc: Nasion to inion	63.0	75.5	82.0
28.	Transverse arc: Tragion to tragion (perpendicular to ear-eye horizon)	64.5	83.0	88.0
29.	Total head height: Lowest point of chin (gnathion) to vertex (perpendicular to ear-eye horizon)	37.0	46.0	47.0
30.	Total face height: Nasion to gnathion	16.0	21.6	22.4
31.	Upper face height: Nasion to middle of mouth	12.0	16.3	17.4
32.	Bizygomatic breadth: Greatest breadth between zygomatic arches	27.0	33.5	35.0
33.	Nasal height: Nasion to subnasal point (where nasal septum and upper lip meet)	11.0	14.0	14.0
34.	Nasal breadth	6.5	7.5	7.5
35.	Breadth of nasal septum: Smallest distance between nostrils	3.0	2.8	3.0
36.	Interocular breadth: Distance between medial angles of eyes	6.8	7.9	7.9
37.	Breadth of mouth	13.0	16.5	16.0
38.	Length of ear: Highest point on helix to lowest point on lobule	13.0	19.0	19.0
39.	Breadth of ear: Greatest breadth between anterior and posterior border of helix	8.3	13.0	13.0

measurements, which are as follows: *Colobus* fetus 1, 112 mm., human fetus of 20 weeks (average), 158 mm.; *Colobus* fetus 2, 134 mm., human fetus of 23 weeks, 191 mm.; *Colobus* fetus 3, 147 mm., human fetus of 24 weeks, 202 mm.

Before taking up the discussion of the outer form and proportions of the *Colobus* fetuses, attention is called to the measurements made, which are enumerated in Table 1. From these absolute measurements relative measurements or indices were constructed according to the formulæ given in Table 2 after the technical term of each index. Next to the indices for the *Colobus* fetuses are given the indices for the adult *Colobus* monkeys (Table 2); and, for further comparison, the average indices of groups of human white fetuses of stages of development corresponding to the *Colobus* fetuses are added. These groups are made up of 16 specimens of 20 weeks, 16 specimens of 23 weeks, and 17 specimens of 24 weeks.

A great many of the proportions which were studied on the fetus could not be obtained on the adult skeletons; therefore the bodies of the juvenile and adult *Colobus vellerosus* were used for comparison. It is not probable that the latter show any marked differences in proportions from the adult *Colobus abyssinicus* or *angolensis*. Where analogous indices from all these species were obtained they did not differ more than the normal variation within one species. Moreover, the fact that the fetuses are of two different species has, according to Table 2, very little, if any, influence on their proportions. It seemed reasonably safe,

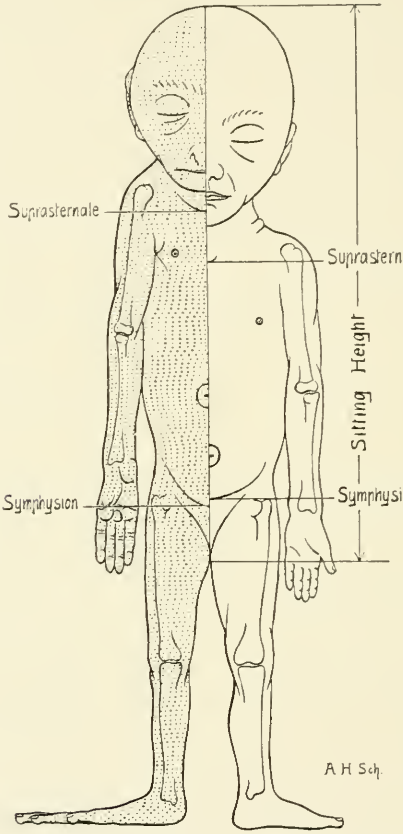

Fig. 1. Schematic drawing of body proportions of *Colobus* fetus 1 (dotted half, ⅔ nat. size) and of human fetus of 20 weeks.

therefore, to study changes in proportions during growth on this series, even though it was composed of different species. Figure 1 shows in a schematic way the body proportions of *Colobus* fetus 1, and for comparison those of a human fetus of 20 weeks, reduced to a sitting-height equal to that of the *Colobus* fetus. The drawing is constructed from the measurements of fetus 1 and from the average measurements of the group of sixteen human fetuses of the 20th week.

The trunk of the *Colobus* fetus is relatively considerably longer than that of the human fetus; in width of trunk, however, the latter surpasses the former. The distance between the shoulders and between the hips, and the diameters and circumference of the chest, relative to the length of the trunk, are much less in the *Colobus* fetus than in the human fetus, but greater than in the juvenile or adult *Colobus*. The extreme slenderness of the trunk in the monkey is not attained, therefore, until adult age; in the fetus the trunk is stouter, but not as stout as in the human fetus, which shows early the relative broadness of the human trunk. According to the thoracic index, the transverse diameter of the chest is, on an average, about equal to the sagittal diameter of the *Colobus* fetus, whereas in the human fetus the width of the chest considerably exceeds its depth. In later stages of growth the chest of *Colobus* becomes narrower, its sagittal diameter being the greatest one. This deep and narrow chest is typical for all adult monkeys, and it was rather surprising to find that in fetal stages the chest was relatively broader. Whether this has any phylogenetic significance is at present difficult to decide. The nipples of the *Colobus* fetus lie relatively higher and closer together on the anterior wall of the trunk than in the human fetus; in the adult *Colobus* they are relatively even higher and farther apart than in the fetus. The shifting of the nipple to a relatively higher level on the trunk demonstrates that in *Colobus* the lower portion of the trunk grows faster than the upper, a fact which is further confirmed by the changes during growth in the proportional lengths of the different regions of the spine. These will be discussed later on. The point of attachment of the umbilical cord is relatively much higher in the *Colobus* than in the human fetus; on the bodies of the juvenile and adult *Colobus* no trace of an umbilicus could be found. This complete absence of any umbilical scar was also noted on different monkeys by Mollison[1] and on some other mammals by Levadoux.[2]

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[1] Mollison, Th. 1910. 'Die Körperproportionen der Primaten.' Morphol. Jahrb., XLII, p. 108.

[2] Levadoux, M. J., 1907. 'Variétés de l'ombilic et des ses annexes.' Fac. de Méd. et de Pharm. de Toulouse, No. 711.

In relation to the trunk, both the upper and the lower extremities are shorter in the *Colobus* than in the human fetus, the difference being greater for the lower extremity. During postnatal development the lower extremities of *Colobus* grow at approximately the same rate as the trunk, so that their relation in length remains almost unchanged. The upper extremities, on the other hand, grow more slowly than the trunk, so that the two lengths approach each other more nearly in the adult than in the fetus. The intermembral index shows the direct relation between the length of the extremities, expressing the upper in percentage of the length of the lower. For the *Colobus* fetuses this percentage is on an average 120, for the human fetuses 106, for adult *Colobus* 109, and for adult man below 100. These figures show that in both man and *Colobus* the lower extremity grows faster than the upper one. From indices XVIII to XX (Table 2) it can be seen that the humerus relative to the femur, and the radius, relative to the tibia, are in *Colobus* shorter in the adult than in the fetus, and approximately equal in monkey and human fetuses. In *Colobus* the relation between the length of the hand and the length of the foot seems to remain constant throughout growth, and differs from that in man, in whom the hand length approaches more closely to the foot length. The relation in length between the radius

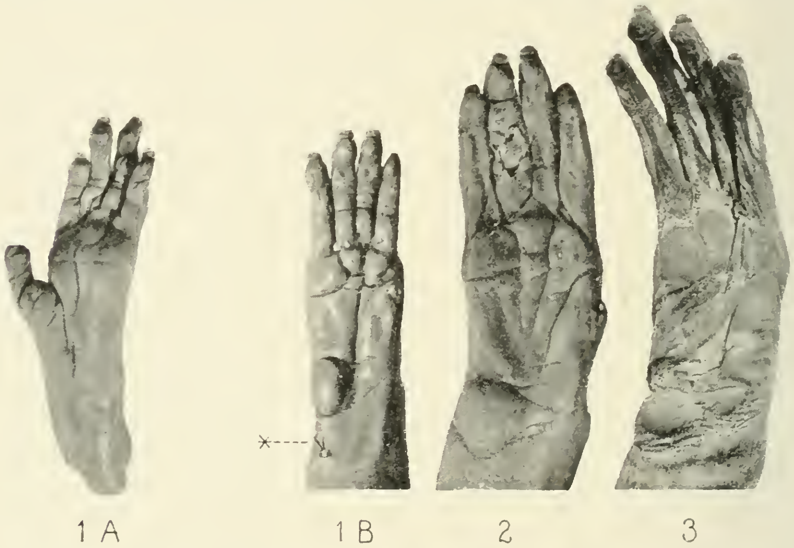

Fig. 2. 1A left foot, 1B right hand of *Colobus* fetus 1; 2 and 3 right hands of fetus 2 and 3 respectively; *vibrissæ (enlarged).

and humerus, and between the tibia and femur changes in *Colobus* during development, inasmuch as the rate of growth, for both upper and lower extremities, is less rapid in the proximal part than in the distal part. In both fetus and adult the forearm, relative to the upper arm, and the leg, relative to the thigh are shorter in man than in *Colobus*. The width of the hand relative to its length is less in the adult *Colobus* than in the fetus; while in the foot the relation of width to length remains unaltered during growth. Both hand and foot of the *Colobus* fetus are considerably more slender than in the human fetus (Fig. 2). The length of the great toe, measured from the heel, constitutes from 66 to 70% of the total foot length. This relation is the same in fetuses as in adults. The longest toes are III and IV; toe II is slightly shorter than toe V. These relative toe lengths remain unchanged throughout development. In adult, as well as in fetal *Colobus*, finger III is the longest, finger IV nearly as long, and finger II even shorter than finger V. The thumb in the genus *Colobus* is rudimentary, as in some of the platyrrhine monkeys (*Ateleus* and *Brachyteleus*). Johnston,[1] speaking of the species *Colobus tephrosceles* Elliot, says that there is only "the minutest trace of a thumb nail in the place where the thumb is missing . . . but the young *Colobuses* of this species have a complete thumb, only a little smaller than this finger would be in the *Cercopitheci*. As the animal grows to maturity, so its thumb dwindles, until in a very old male there may be absolutely no trace left of the missing finger."

Apparently the degree of reduction of the thumb and the age at which it disappears completely from the surface may vary in different species, inasmuch as the fetuses of *Colobus abyssinicus ituricus* (1 and 2) show but little evidence of a thumb (somewhat more in the younger specimen than in the older one) and there is no trace whatever of a thumb nail. In the skeleton of the adult of this species (4) a metacarpus, half the length of metacarpus II, and one short phalanx constitute the thumb. In the fetus of *Colobus angolensis cottoni* (3) no outer trace of a thumb can be seen although its end can be palpated, and in the adult skeleton of this species (5) a short metacarpus and a rudimentary phalanx form the thumb. Of the two specimens of *Colobus vellerosus*, the juvenile one shows the rudimentary outer thumb somewhat freer and slightly larger than the adult specimen; however, no sign of a thumb nail could be found in either of these. They both contain a well ossified metacarpus and one phalanx for the thumb. X-ray pic-

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[2]Sir Harry Johnston. 1904. 'The Uganda Protectorate,' I, p. 362.

tures of all the fetuses showed on each hand a metacarpus I less than half the length of metacarpus II. The length of the rudimentary thumb, measured from the styloid process of the radius, varies from 30 to 44% of the total hand length, without showing a clear tendency either to reduce or increase during growth.

The relatively small size of the head of the *Colobus* fetus is first noted when compared with human fetuses of corresponding development. The average circumference of the brain part of the head is considerably less than the sitting height (index XXI) in the *Colobus* fetuses, whereas it is greater in the human fetuses. In adult *Colobus* the average circumference amounts to less than half the sitting height. The average diameter of the head is about 50% of the trunk length (index XXII) in the *Colobus* fetus, 70 to 78% in the human fetus, and only 20% in adult *Colobus*. Besides this difference in the size of the head in *Colobus* and human fetuses, there is a marked difference in shape, the height of the head in relation to its length being much less in the former than in the human fetus. In adult *Colobus* the head is relatively lower still than in the fetus. The face part of the head in the *Colobus* fetus is smaller, relative to the trunk, than in the human fetus, but considerably larger in relation to the brain part. The nose is relatively longer and narrower than that of the human fetus. The nasal index is unusually low and drops during growth, just as in man.[1] The width of the nasal septum is greatest, relatively,

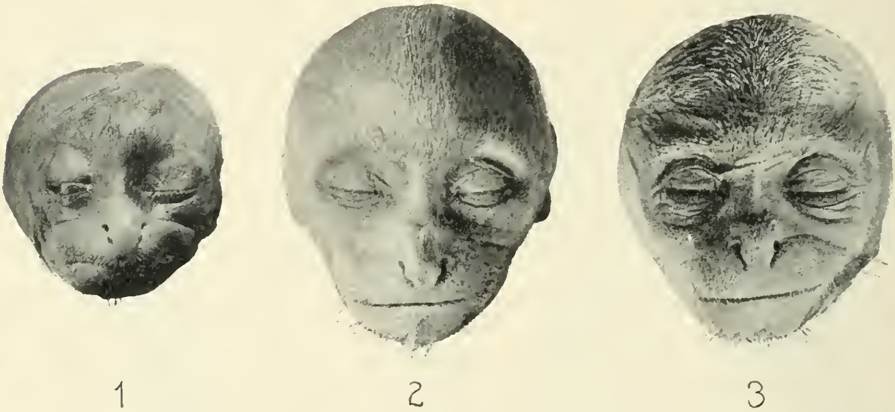

Fig. 3. Front views of the heads of the *Colobus* fetuses 1, 2, and 3 (approximately nat. size).

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[1] Schultz, A. H. 1920. 'The development of the external nose in whites and negroes.' Contrib. to Embryology, No. 34; Pub. 272, Carnegie Inst.

in the smallest of the monkey fetuses, and in all of the specimens of *Colobus* is rather broad for catarrhine monkeys. The relative interocular breadth is slightly less in the *Colobus* than in the human fetus and decreases with advancing development. The high value for this index (XXXIII) in the adult *Colobus* (7) is very probably an extreme variation and rarely to be found in monkeys, whose eyes, as a rule, are relatively closer together than those of man. The ear, relative to the size of the head (XXXV) is very much larger in the *Colobus* than in the human fetus. Figure 4 shows the gradual rolling in of the helix edge during development; in fetus 3 this has occurred at two independent points, the apex of the ear bending over earlier than the portion of the helix immediately above. The ear opening in the human fetus lies about equidistant between the extreme oral and aboral points on the head; in the *Colobus* fetus it is situated farther back, though not quite so far back as in adult *Colobus*.

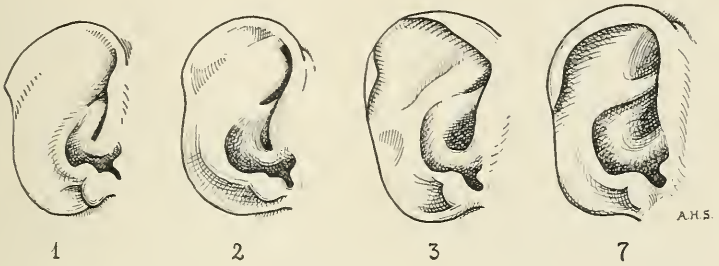

Fig. 4. Sketches of the outer ears of *Colobus* fetus 1, 2, and 3 and of adult *Colobus* 7.

The lanugo of the *Colobus* fetus apparently makes its appearance at a slightly earlier stage of development than is represented by fetus 1, as the latter has a very few light microscopic hairs on the back and a few on the tip of the tail; with the exception of these and the hair on the head, the fetus is still entirely naked. The longest hair is found in the eyebrows, which are formed of black vibrissæ which are densest over the glabella. The eyelashes are composed of a few short black hairs. There are a few somewhat longer black hairs on the upper lip and chin, and close around the mouth are fairly strong light hairs. The scalp bears fine, very short light hair, directed backwards. Among these hairs are three somewhat longer black hairs on each side of the head, in front and above the ears. On the external ears a few short black hairs are found on the tragus, antitragus, crus helicis, and anthelix. Over the entire body surface of fetus 2 are fine, very short, light hairs. On the arms and thighs, on the proximal dorsal part of the tail, and on the dorsal surface of the hands and feet are scattered some slightly longer black hairs. The entire head, including the face, is covered by a thick growth of fine light hair which, on the forehead and scalp, is directed straight backward without any parting at the center, or any whorls such as are seen in human fetuses. Even the eyelids bear a coat of fine short light hair. In fetuses 2 and 3, as in fetus 1, the eyebrows are composed of black vibrissæ, the eyelashes are black, and there are some fairly long black hairs on the upper lip and chin. Fetus 3 is also entirely covered with light hair, which is somewhat longer than in fetus 2, rather glossy, and almost white in color. The upper extremities bear a thicker coat than the lower ones, where the hair seems to have made its appearance later. The inner sides of the thighs are almost naked. The fine white body hair of fetus 3 extends for a distance of 5 mm. on the umbilical cord where it points away from the body. The rather long hair on the forehead and scalp is directed backward and slightly sidewise, but without being really parted in the middle. On all parts of the external ear fine light hair and longer black hairs are found. In fetus 2 the ear is covered by fine black hairs only. In both fetus 2 and fetus 3 the lanugo on the hands and feet extends only to the last interphalangeal joints, and no hair is found on the dorsal side of the last phalanges. In all three specimens there is a fairly large bald area on each buttock which later develops into a callosity.

Fetus 1, the youngest of the series, shows a very small but distinct round elevation of the skin on the inner, ulnar side of the forearm, just proximal to the carpus, on which two black vibrissæ (sinus hairs) can be detected on close examination (Fig. 2). These two hairs are the only ones on the arm and, like the vibrissæ on the face, most probably make their appearance before the lanugo. Among the short hair on the forearm of fetus 2, two considerably longer and stronger black vibrissæ are found at a place analogous to that on which they appear on the younger fetus. Fetus 3, of a different species, has four long black vibrissæ at the same place on the forearm. These can be easily seen among the light and shorter hairs. In the two older fetuses the skin elevation at the base of the vibrissæ is less pronounced than in the youngest fetus. In all three fetuses these vibrissæ are present on each arm and point straight forward towards the hand.[1] In the adult *Colobus* no trace of these vibrissæ can be seen. It seems quite safe to the author to assume that these vibrissæ of the *Colobus* fetuses are identical with those described by Beddard[1] under the term "carpal vibrissæ." This author states that they are situated "on the wrist close to the root of the thumb and generally on that (the radial) side of the forearm." However, from his and Sutton's[2] illustrations, it seems that they are not infrequently situated somewhat proximal to the carpus and may also extend to at least the middle of the inner side of the forearm, so that there seems to be no fundamental difference in the location of these vibrissæ as found by Beddard and by the author. Beddard mentions a carpal tuft, containing from one to twenty vibrissæ, in many groups of mammals, and states that "the most salient feature as to its absence or presence is its nearly universal existence in the lemurs and the absolutely universal absence in the monkeys . . . It is not without interest to be able to bring forward a character which seems to absolutely distinguish these two divisions of the Primates."

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[1] Analogous sinus hairs were observed by the author in a fourth *Colobus* fetus of a different species; see Schultz, A. H., 1924, 'Growth studies on primates bearing upon man's evolution,' Amer. Journ. Phys. Anthrop., VII.

In this connection the finding of carpal vibrissæ in a catarrhine monkey fetus, where they develop only to disappear again in later stages of growth, is quite significant. The very frequent occurrence of carpal vibrissæ in Prosimiæ, and their reappearance in the fetal stage of a monkey constitutes further proof of a close relationship between these two groups of mammals. Among platyrrhine monkeys Frédéric[3] found sinus hairs on the forearm of *Hapale jacchus*, so we now know that carpal vibrissæ are represented in monkeys of both the Old and the New World.

For the study of the skeletal system several X-ray photographs were taken of each *Colobus* fetus. In addition, fetus 2 was stained with toluidin blue and cleared in a 2 per cent solution of potassium hydroxide, a process which, in addition to the ossified parts, shows the cartilage in blue color. Figure 5 is an exact drawing of the cleared specimen and may serve to illustrate the following description.

The spinal column consists of 55 vertebræ: 7 cervical, 12 thoracic, 7 lumbar,[4] 3 sacral, and, on an average, 26 caudal. Marked variations in these numbers occur in the caudal vertebræ, which were 28 in fetus 1, 25 in fetus 2, 27 in fetus 3, 25 in skeleton 4, and 26 in skeleton 5. In table 3 the lengths of the different spinal regions are expressed in percentages of the præcaudal length of the spine. The values for the human fetuses are

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[1] Beddard, F. E. 1902. 'Observations upon the carpal vibrissæ in mammals.' Proc. Zoöl. Soc. London, 1, p. 127.

[2] Sutton, B. 1887. 'On the arm-gland of the lemurs.' Proc. Zoöl. Soc. London, p. 369.

[3] Frédéric, J. 1905. 'Untersuchungen über die Sinushaare der Affen, nebst Bemerkungen über die Augenbrauen und den Schnurrbart des Menschen.' Zeitschr. f. Morph. u. Anthropol., VIII, p. 239.

[4] Fetus 2 has only 6 lumbar vertebræ.

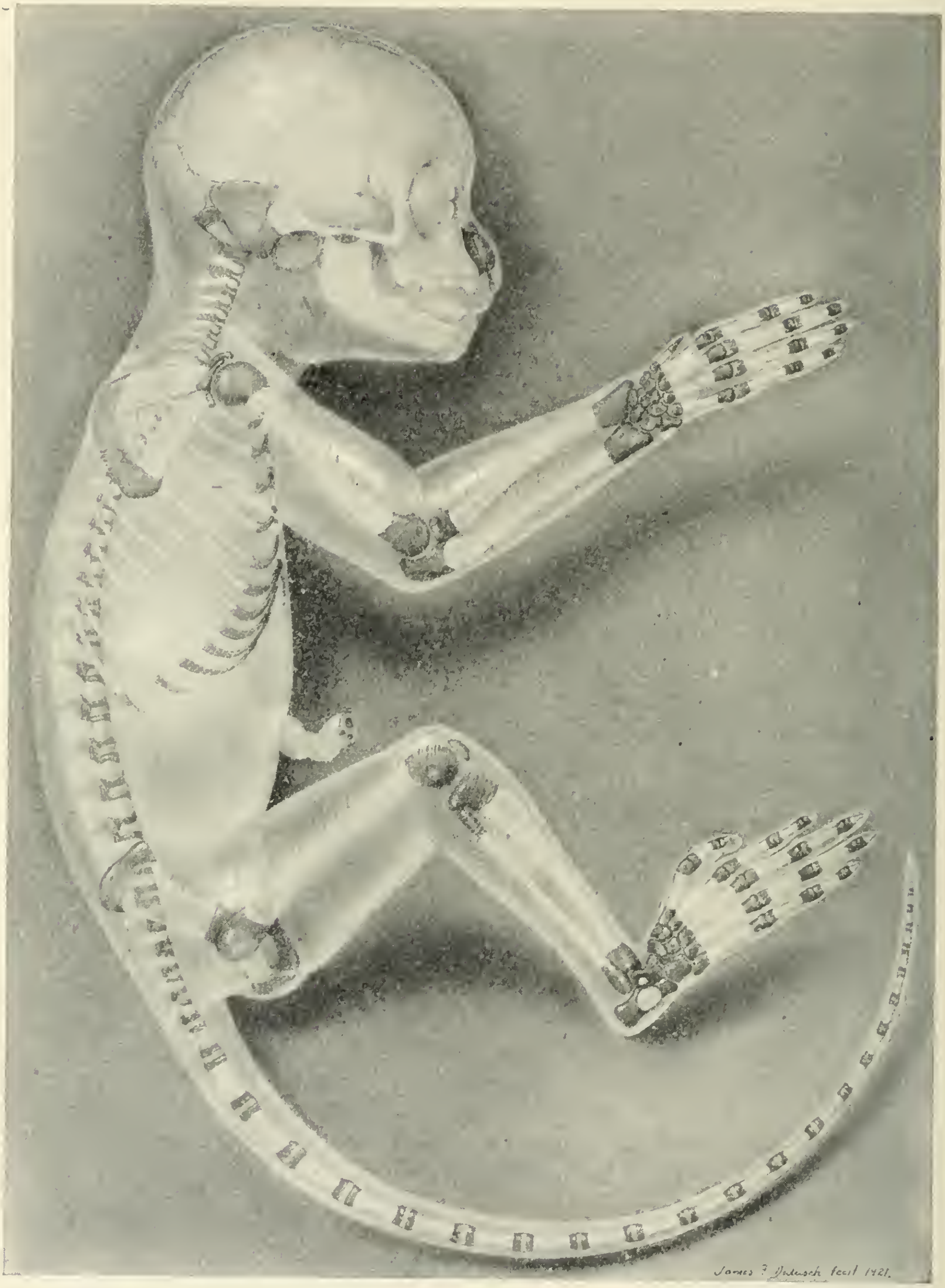
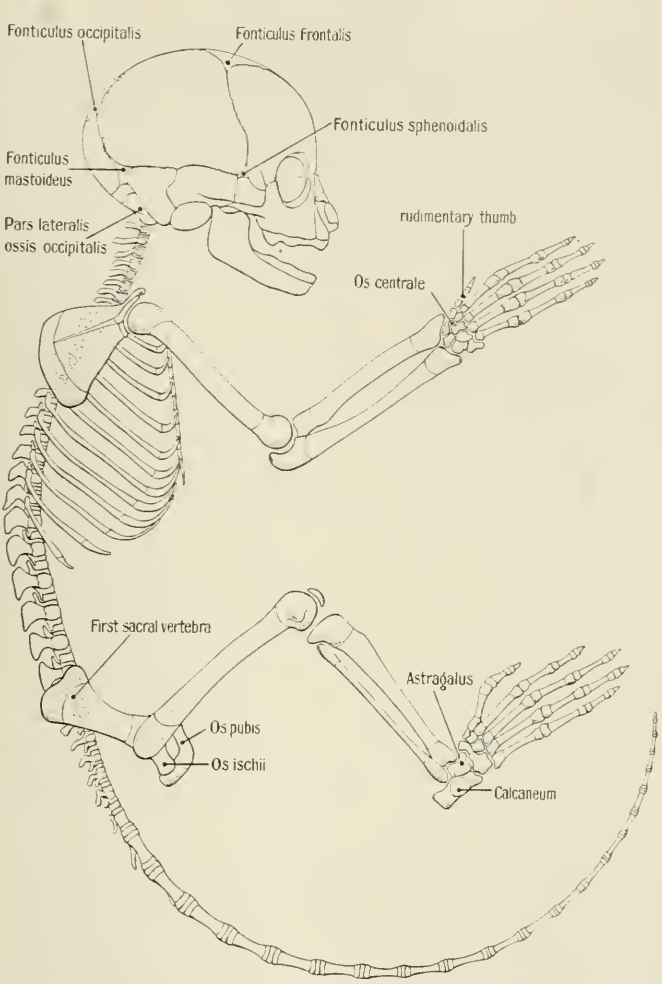

James F. Didusch fecit 1921.

Fig. 5. Side view of cleared fetus 2 (slightly less than nat. size).


Fonticulus occipitalis
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Fonticulus sphenoidalis
Fonticulus mastoideus
Pars lateralis ossis occipitalis
rudimentary thumb
Os centrale
First sacral vertebra
Astragalus
Os pubis
Os ischii
Calcaneum

(Diagrammatic explanation of Figure 5)

the averages of two to four specimens for each age group. Those for human adults are taken from Martin.[1]

Table 3 shows that the relative length of the cervical region is considerably less, and that of the thoracic region slightly less in *Colobus* than in man. The relative length of the lumbar region is very much greater, and that of the sacral region markedly less in *Colobus* than in man.

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[1] Martin, R. 1914. 'Lehrbuch der Anthropologie.' Jena, G. Fischer.

These differences exist between fetuses as well as between adults of the two primates compared. It is of especial interest to note that in both *Colobus* and man the relative length of the cervical region and of the thoracic region decreases during growth, while the relative length of the lumbar region increases. The length of the caudal region of *Colobus* is relatively greater in adults than in fetuses. This is still more clearly shown when the length of the tail is expressed in percentage of the sitting-height. For the fetuses (1, 2, and 3) these percentages are 104.4, 110.4, and 109.5 respectively; for the adults (6 and 7) they are 167.5 and 158.5 respectively. The tail, therefore, has a more rapid rate of growth than the body.

Table 3.—Lengths of the Different Spinal Regions in Percentages of the Precaudal Length of the Spine in *Colobus* and Man

			Region of Spine				
			Cervical	Thoracic	Lumbar	Sacral	Caudal
COLOBUS	Fetus	No. 1	15.6	40.0	34.4	10.0	137.8
		2	14.2	39.6	35.8	10.4	136.8
		3	14.4	39.5	34.9	11.2	149.6
	Adult	4	12.7	37.4	40.2	9.7	152.1
		5	12.7	37.6	39.8	9.9	166.0
MAN (white)	Fetus	Weeks					
		14	21.5	40.5	21.1	16.9	....
		18	21.9	41.7	21.5	14.9	....
		22	20.5	41.3	22.3	15.9	....
		39	19.2	40.0	22.8	18.0	....
	Adult		16.0	39.0	25.0	19.0	....

There are twelve pairs of ribs which are well ossified in all of the fetuses. Their osseous shafts seem to have about the same proportional length, in regard to the costal cartilages, as in the adult stage. The first seven pairs of ribs insert directly on the sternum; the next three pairs insert indirectly; and the last two pairs are floating ribs. In fetus 2 and fetus 3 the sternum shows five ossification centers: a large one for the manubrium and four shorter ones for the corpus. The xyphoid process shows no ossification as yet. The sternum of fetus 1 is still entirely cartilaginous. The shafts of the clavicles are well ossified in all three fetuses, as are also the blades of the scapulæ; but no centers are found in the acromion, coracoid process or the cartilage of the vertebral margin of the scapula in any of the specimens. In the fetus the scapula is relatively much longer in the direction of the scapular spine and narrower, perpendicular to the latter, than in the adult. The scapular index (distance between center of glenoid fossa and terminus of spinal axis on vertebral margin × 100, divided by distance between superior and inferior angles) amounts to 127 in fetus 1 and to 96 in the adult (average of skeletons 4 and 5). The pelvis, even in the youngest fetus, contains two pairs of ossification centers; one in the ilia and one in the ischia. The pubic bone, even in fetus 3, is still entirely cartilaginous. All the shafts of the long bones of the extremities are ossified, but their epiphyseal ends show no sign of ossification. The tibia has a rather marked proximal retroflexion, a condition which is but little more pronounced in the adult *Colobus*. The carpus in all three fetuses is completely cartilaginous and contains a well-developed free centrale. Among the tarsal cartilages the calcaneum in fetuses 2 and 3 possesses a large, the talus a small ossified zone. Fetus 1 has only an ossification center in the calcaneum. It is in the tarsus that ossification appears to have begun at a slightly earlier stage of development than in the human fetus. The sternum is probably the only other skeletal structure which shows a similar behavior, inasmuch as in man centers for the corpus sterni normally do not appear until the end of fetal life, whereas they are already present in *Colobus* fetuses 2 and 3. Ossification in all the others parts of the body seems to correspond fairly closely to the process in human fetuses of 20 to 24 weeks.

Most of the elements of the skull are already ossified to a considerable extent, evne in fetus 1. In this and fetus 2 only the cranial surface of the petrosum seems to be still entirely cartilaginous. In all three fetuses the lateral occipital bones still have a broad cartilaginous zone at their posterior ends. The orbits are relatively larger and the frontal bones more highly arched in the fetus than in the adult *Colobus*. The anterior fontanelle is fairly large, extending in a long arm halfway between the frontal bones. The posterior and the two pairs of lateral fontanelles (fonticulus mastoideus and sphenoidalis) are small and not quite the same relative size as those of human fetuses of corresponding stages of development.

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